
Chapter 1 – Construction Site Management

The purpose of this section is to identify the management practices that should be employed at construction sites to guarantee a successful project before, during and through a lifetime of site use and maintenance. The Bellevue Parks & Community Services Department manages construction sites to preserve existing vegetation and infrastructure for several reasons:

- To sustain both the function and value of vegetation assets
- To enhance public safety by carefully maintaining the health of onsite vegetation and to reduce liability
- To contain costs associated with site resoration
- To reduce or avoid soil compaction and degradation
- To avoid physical injury to existing trees
- To avoid root injury to trees and other vegetation
- To protect soils and hydraulic integrity of the entire site
- To protect existing irrigation, utilities and underground drainage
- To prevent sediment-laden and/or polluted runoff from entering drainage systems and water bodies (streams, wetlands, lakes).

1.2 Definitions

Construction Site Management — Refers to the management of construction activities during three phases of site development: pre-construction, construction, and post-development. These include BMP's for soils, shrubs, trees, drainage patterns, and irrigation systems. Tree preservation is a special concern during construction because tree roots can often extend throughout an entire site, and mature trees increase property value.

Critical Root Zone (CRZ) – The circular area around the base of a tree calculated as half the distance to the tree's dripline.

"Dial-Before-You-Dig" — A statewide system is in place to allow contractors to locate underground utilities before construction. This contact is mandatory. The phone number is **1-800-424-5555** (account #34476).

Diameter at Breast Height (DBH) — The diameter of the tree trunk at four and one-half feet (or 54 inches) above natural grade level. The diameter may be calculated by using the following formula: $DBH = \text{circumference at 4.5-feet} \times 3.14$. To determine the DBH of multi-trunk trees or measuring trees on slopes, consult the current *Guide for Plant Appraisal*, published by the Council of Tree and Landscape Appraisers.

Project Manager— Refers to either the person assigned to the construction project by the department or the contractor who is responsible for managing the overall project. Project management duties include schedule, budget, and related logistics, including construction site management.

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Root Buffer — A temporary layer of material to protect the soil texture and roots. The buffer shall consist of a base course of tree chips spread over the root area to a minimum of 6-inch depth, capped by a layer of 3/4-inch quarry gravel to stabilize 3/4-inch plywood on top.

Soil Compaction — The compression of soil particles that may result from the movement of heavy machinery and trucks, storage of construction materials, structures, paving, etc. within the *tree protection zone*. Soil compaction can result in atrophy of roots and potential death of the tree, with symptoms often taking 3 to 10 years to manifest.

Temporary Erosion & Sedimentation Control (TESC) — A system of best management practices on a construction site designed to prevent displacement of soil particles and remove eroded sediment from storm water.

Tree Protection Fencing — A temporary enclosure erected around a tree to be protected at the boundary of the *tree protection zone*. Tree protection fencing should consist of six 6 foot high chain link fence, mounted on two inch diameter galvanized iron posts, driven into the ground to a depth of at least 2-feet at no more than 10-foot spacing. The fence serves three primary functions: 1) to keep the crown, branch structure and trunk clear from direct contact and damage by equipment, materials or disturbances; 2) to preserve roots and soil in an intact and non-compacted state; and 3) to identify the tree protection zone in which no soil disturbance is permitted and activities are restricted.

Tree Protection Zone (TPZ) — The circular area around the base of a given tree calculated as 1 foot of radius for every inch of trunk diameter measured at DBH

Warning Sign — A warning sign shall be prominently displayed on each fence. The sign shall be a minimum of 8.5 x 11-inches and clearly state: "WARNING – *Tree Protection Zone* - This fence shall not be removed and any injury to this or these trees is subject to penalty according to BCC 14.06.100."

1.3 Background

Many problems encountered in landscape maintenance can be traced to poor management of original construction. If construction equipment improperly strikes or grades over vegetation, those plants often suffer or die. If a site's soil is overly compacted, contaminated or displaced, it will not allow the air and water movement essential for healthy root zones and plants. If hydrologic processes on site are disrupted, the site may forever have drainage problems. These and other construction-related impacts can produce long-term maintenance problems that can be avoided by following the BMPs set forth in the remainder of this chapter.

1.4 Best Management Practices

Pre-Construction

- The project manager shall know and understand the development and building regulations concerning trees and vegetation in the area.
- The project manager will contact “Dial-Before-You-Dig” (1-800-424-5555) to locate any underground utilities onsite before construction begins.
- The project manager will be responsible for decisions related to vegetation on site before and during removal.
- The site shall be inventoried and surveyed if necessary. Site inventory includes determining size, species, numbers, and numbers of trees/plants on site; locating irrigation and drainage systems and problems, if any, of root intrusions into the drainage and other utility systems. Property corners should also be identified, prior to work.
- The project manager shall ensure that irrigation and drainage systems are operable and adequate.
- The project manager shall identify and protect natural water flows and drainage patterns and maintain vegetated buffers.
- An erosion control plan and turbidity monitoring plan for projects near streams and wetlands shall be developed.
- The project manager shall ensure all temporary erosion sediment control measures are in place prior to groundbreaking.
- All trees and plants to be preserved and protected shall be identified on site plans.
- The project manager should consult the site manager(s) for site history and maintenance prior to finalization of site plans.

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Construction Site Preparation

- Staging areas for equipment shall be established far enough from plant material so that existing plants and their roots are protected.
- Entry and exit routes shall be established and fenced off with chain link or construction fencing. When planning routes, avoid utility access corridors.
- 6' high chain-link fencing, or other adequate tree protection fencing shall be installed around the tree protection zone and any other vegetation that will remain onsite. At the discretion of the project manager, the fencing shall be installed at least 1 foot out from the trunk for every inch diameter of the existing trees or farther.
- If tree protection cannot be installed at the predetermined TPZ because of site constraints, the fencing can be moved no closer than the CRZ and an adequate root buffer shall be constructed in the affect area of the TPZ.
- Irrigation and drainage systems shall be protected from damage unless plans call for renovation of such systems.
- All trees and plants in the construction zone shall be pruned to remove deadwood and prevent damage from construction equipment.
- Trees/plants to be preserved shall be watered and fertilized before and after construction. Existing plants and trees should be fertilized at the discretion of the project manager.

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Trees vary in their ability to adapt to altered growing conditions. Mature trees have established stable biological systems in the pre-existing physical environment. Disruption of this environment by construction activities interrupts the tree's physiological processes causing depletion of energy reserves and a decline in vigor, often resulting in the tree's death. Typically, this reaction may develop from one to seven years after disruption. The tree protection BMPs are intended to eliminate undesirable consequences that result from uninformed or careless acts, and preserve both trees and property values. The following BMPs, if followed, will reduce the negative impacts of park construction on trees.

- Tree protection fencing will be constructed at the outer limit of the TPZ. If the fencing must enter inside the TPZ, root buffer will be constructed. One warning sign will be displayed for every 15 feet of lineal fencing, facing toward the work area. No activity is allowed in the CRZ of the trees being protected.
- On occasion, trees will need to have branches pruned in order to facilitate access to a construction site or the construction of a new facility. Pruning will follow International Society of Arboriculture Pruning Guidelines.
- Trenching and excavation activities are prohibited within the TPZ.
- When utility installation must occur within the TPZ, tunneling shall be the preferred method to install such utilities. The tunnel shall be dug either by hand, air spade, hydraulic vacuum or mechanically boring the tunnel under the roots with a horizontal directional drill and hydraulic or pneumatic air excavation technology.
- Construction shall be monitored regularly to ensure compliance with specifications. Work shall be stopped if construction site management BMP's are not being followed by the contractor.
- Cement washout pits and chemical holding areas shall be located away from vegetation protection areas, streams, and wetlands.
- Contractor parking and material storage shall be limited to already impacted areas away from tree roots.
- Site offices and equipment shall not encroach into vegetation protection areas.
- Whenever possible, control and minimize grade changes within vegetation protection areas. Generally, no changes in grade should occur within the TPZ of any tree to remain on site. This area may be increased at the discretion of the project manager. If the grade must be raised around a desired tree, a dry well shall be constructed around the tree at the drip line or some point farther out.
- Refueling and maintenance areas shall be kept away from trees, native soils, water bodies and drainage systems. Fuel spills will not be tolerated on construction sites. If pollutants leak or are discharged into a water-body, the City of Bellevue Clear and Grade Inspector, as well as the Department of Ecology shall be contacted.
- To the extent possible, construction equipment shall be kept away from all onsite vegetation, especially those within designated protection areas.
- TESC implementation, maintenance, and removal shall follow City of Bellevue regulations.

Post-Construction

Maintaining preserved and establishing new vegetation are the primary focus following construction. This requires identifying problems and treatments that may preserve these resources. If warranted, severely damaged vegetation should be removed and replaced by the contractor at their expense with new plantings.

The following practices should be employed to preserve vegetation:

- Weekly water management (most important item), at least 1" per week between May 1st & Sept. 30th, corresponding with drier weather.
- Ensure contractor compliance with plant establishment warranty period.
- Fertilize with an appropriate product, as needed.
- Wait one growing season for pruning and minimal nitrogen applications. Maintain levels for 3 to 5 years.
- Maintain a depth of 2 to 3 inches of mulch around trees and shrubs, and new plantings.
- Watch closely for pests and changes in plant structure. Preventative treatments may be advisable.
- Maintenance staff shall closely monitor and inspect all new construction throughout the warranty period to ensure plant establishment.
- Special emphasis will be placed on weed control during the plant establishment period (3 to 5 years).

Mitigating Tree and Infrastructure Conflicts

Conflicts may occur when tree roots grow adjacent to paving, foundations, sidewalks or curbs (hardscape). Improper or careless extraction of these elements can cause severe injury to the roots and instability or even death of the trees. The following alternatives must first be considered before root pruning within the TPZ of a tree.

1. Removal of Pavement or Sidewalk:

Removal of existing pavement over tree roots shall include the following precautions: Break hardscape into manageable pieces with a jackhammer or pick and hand load the pieces onto a loader. The loader must remain outside the TPZ on undisturbed pavement or off exposed roots. Do not remove base rock that has been exploited by established absorbing roots. Apply untreated wood chips over the exposed area within one hour, then wet the chips and base rock and keep moist until overlay surface is applied.

2. Replacement of pavement or sidewalk:

An alternative to the severance of roots greater than 2- inches in diameter should be considered before cutting roots. If an alternative is not feasible, remove the sidewalk, as stated above, cut roots with a sharp, clean saw, as approved by the project manager or Urban Forester and replace sidewalk using #3 dowels at the expansion joint if within 10-feet of a street tree. Use a wire mesh reinforcement if within 10-feet of the trunk of a tree. Note: Any work in the right-of-way requires a ROW usage permit from the Transportation Department.

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3. Alternative methods to prevent root cutting:
 - Grinding a raised sidewalk edge.
 - Ramping the walking surface over the roots or lifted slab with pliable paving.
 - Routing the sidewalk around the tree roots.
 - Install boardwalk, flexible paving or rubberized sections.
4. New sidewalk or driveway design should consider alternatives to conventional pavement and sidewalk materials. Substitute permeable materials for typical asphalt or concrete overlay, sub-base or footings to consider are: permeable paving materials (such as ECO-Stone or RIMA pavers), interlocking pavers, flexible paving, wooden walkways, and brick or flagstone walkways on sand foundations.
5. Avoid tree and infrastructure conflicts and associated costs by the following planting practices:
 - Plant deep rooting trees that are proven to be non-invasive.
 - Over soil that shrinks and swells, install a sidewalk with higher strength that has wire mesh and / or expansion slip joint dowel reinforcement.
 - Fracture soil with an air spade and backfill with sand prior to planting to promote deep rooting and improved drainage.
 - Install root barrier only along the hardscape area of the tree and allow roots to use open lawn or planter strip areas.
 - Dedicate at least 10-linear feet of planting space for the growth of each tree.
 - Provide a dedicated irrigation system or zone for the tree, so the trees do not have to compete and are not dependent on the turf and shrub irrigation.
 - Avoid planting trees over underground drainage systems where root intrusion will impede function of the system.
6. Alternative Base Course Materials

When designing hardscape areas near trees, the project architect or engineer should consider the use of recommended base course material such as an engineered structural soil mix. An approved structural soil mix will allow a long term cost effective tree and infrastructure compatibility that is particularly suited for the following types of development projects:

 - repair or replacement of sidewalk greater than 40-feet in length;
 - planting areas that are designed over structures or parking garages;
 - confined parking lot medians and islands or other specialized conditions as warranted.

1.5 Training

- Provide training to all construction personnel to make sure they understand all construction site BMPs.
- The project manager and the designated site manager(s) shall receive the most recent training and education dealing with construction site management. This training includes the most recent

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advances for protecting trees, and erosion control, on construction sites.

- Urban Foresters and site managers should receive training in appraising and evaluating tree and plant damage according to International Society for Arboriculture standards.

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Chapter 2 - Integrated Pest Management

The City's parks and natural areas are a reflection of the values of the community. The Parks Department strives to ensure that public landscapes remain attractive and meet the expectations of thousands of users, and preserve natural ecosystems for future generations. These green open spaces offer Bellevue residents the opportunity to enjoy a natural environment within their community. Trees, shrubs, flower beds, ponds, rivers and lakes make up these open spaces, and require maintenance and protection from damage by both humans as well as biological pests.

Integrated pest management is a sustainable approach to managing pests by combining biological, cultural, physical and chemical methods in a way that will minimize the effects on the environment, minimize domestic and health risks, while considering budgetary restrictions. The Parks Department adopted an IPM program in 1997, which has been integrated into this document, which outlines how both passive and active modes of maintenance are vital to the preservation of any environment. The objectives of the Parks Department's IPM program are as follows:

- To protect the health, safety, and welfare of the community
- To provide efficient cost effective maintenance of the City's park resources, which includes non-chemical controls whenever possible
- To design new and renovate existing landscape areas that suit site conditions with sustainable maintenance practices, thus providing a comprehensive stewardship of parks and natural resources
- To restore, create and protect environmentally valuable areas such as wetlands and riparian areas, aquatic and terrestrial wildlife habitat, forests, and meadow areas.

2.2 Definitions

Integrated Pest Management – A decision-making process to determine if, where, when and how pest problems will be managed. An IPM program includes all potential pest control strategies, but focuses on non-chemical controls whenever possible, in order to perpetuate a sustainable environment. The following four pest control methods may be employed in an IPM program:

- **cultural control:** The use of sound horticultural practices to optimize plant health and to suppress insects, disease, and weed growth. Other cultural controls include site-appropriate design and the use of disease or drought-resistant plants.
- **mechanical control:** The use of a variety of tools and equipment for the purpose of eliminating pests.
- **biological control:** The use of biological control agents that act as predators or parasites of pest species. The use of other beneficial organisms that improve plant health by enhancing soil quality.

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- **chemical control:** The application of various agricultural products such as herbicides, insecticides or fungicides or other chemical compounds to a target pest as a means of control.

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MSDS – Material Safety Data Sheets or MSDS are prepared by manufacturers of chemical products to relay the necessary safety and protective information to users about the said chemical compounds.

Pesticide – Any material including agricultural chemicals, herbicides, insecticides and fungicides, or biological agents “ applied to a target pest as a control measure.

Pest – The word “pest” has been broadly defined in this document to include “injurious” insect species, plant pathogens, noxious or invasive vegetation, vertebrate animals such as rodents, structural pests or any other factor that creates an unhealthy environment for landscapes and structures.

Threshold – The term “threshold” refers to the point at which pest injury can no longer be tolerated without compromising the health or aesthetic value of a plant, ecosystem or other assets of value including human health. Once a threshold is being approached, some control measure may be necessary to suppress pest activity to acceptable levels.

2.3 Background

Policies and Regulations

By legal definition, a pesticide is any substance for which a manufacturer or distributor claims pesticidal value. Today there are more than 32,000 pesticide products registered to destroy, prevent, attract, or in some manner, control pests.

The first act of pesticide control was passed in 1910 called the Insecticide Act of 1910. Since then there has been the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIRFA) and more recently, the Federal Environmental Pesticide Control Act of 1972. The major provisions of this act are:

- All pesticides must be registered with the U.S. Environmental Protection Agency (EPA). Qualified states may also register pesticides under special conditions.
- All pesticides will be classified for either general or restricted use.
- Only certified applicators, or those under their supervision, may apply restricted use pesticides. States have the authority to certify applicators.
- Use of pesticide inconsistent with labeling instructions is prohibited.
- Violators may be fined or imprisoned or both.

In order to comply with this act as well as other regulations, the City of Bellevue has established its own Hazard Communication Program, which integrates into the Park’s IPM program as well, to ensure that all employees remain informed and receive the proper training when dealing with hazardous chemicals and their application. The components of this will be discussed later in this chapter.

Other important regulations pertain to working within a protected areas, such as wetlands and riparian corridors, steep slopes and native growth protection areas. Certain activities are restricted in these areas and may require special permits granted by the City of Bellevue and other regulatory agencies. Further description of these areas and their restrictions will be described in specific chapters of this manual.

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Pesticide Use Decision

The following agencies and individuals are involved in the determination of when to use pesticides in Bellevue Parks.

- The **Washington State Department of Agriculture (WSDA)** sets the overall policy for pesticide use in the state of Washington. The approved chemical list can be seen on their website at www.agr.wa.gov.
- The **Washington Department of Ecology (WDOE)** requires a special permit for all aquatic herbicide applications. This permit allows herbicide control for all listed noxious weeds within an aquatic environment and monitors impacts levels on non-target plants.
- The **Planning and Community Development Office (PCD)** has authority to determine whether the City of Bellevue will use particular approved pesticide products, and inventory them. Actual chemicals are stored at Resource Management, in a chemical storage facility. PCD will normally consult with Parks before making these recommendations.
- The **Park Resource Managers, Park Resource Crew Chiefs and Golf Course Superintendents** are responsible for upholding and applying City and Park's pesticide policies and procedures within their areas of control. They are also responsible for ensuring that any personal protective equipment (PPE) is available and properly fitted for use by applicable staff for any chemical application.
- The **Site Managers and Crew Leaders** determine the most appropriate control measure for actual landscape pest situations, including selecting the most appropriate pesticide products, if necessary. In golf maintenance, this responsibility rests with the **Golf Course Superintendent** or their immediate assistant. They are also responsible for the safe storage and handling of pesticides, spill responses, and related training.
- The **Risk Manager** is responsible for coordinating the mandatory annual recertification training for all licensed pesticide applicators, officially called "Pesticide Operators."

Pest Management Guidelines

The following pest management guidelines generally apply to all City of Bellevue Parks and Community Services landscapes:

- Park landscapes will be designed to minimize pest management. Where resources are available and existing design themes will not be compromised, modifying landscapes will be considered to reduce pest management.
- All reasonable, cost effective non-chemical pest control options will be considered first before resorting to the use of pesticides

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- Parks will practice IPM in all pest management situations, understanding that some situations will require the use of a pesticide product.
- Certain levels of pest problems or populations will be accepted within established thresholds. Those thresholds will vary with the pest and the landscape setting. (see individual chapters)
- Parks will not perform prophylactic or calendar-based pesticide applications.
- Only pesticides approved for that particular use will be used for the prescribed applications. When pesticides are applied, the smallest effective area will be treated, and the application will be timed to minimize public contact and the effects on the environment.
- Whenever possible, pesticide applications will be carefully timed to control the pest and reduce the need for re-treatment.
- In accordance with the Washington State Licensing Guidelines, all staff and contractors who are engaged in the use, application and storage of pesticides, shall have a current Washington State Pesticide License. Contractors must notify appropriate Department representatives prior to the application of any pesticide for approval to use such pesticides.
- Parks pesticide applicators shall strictly observe all pesticide products label requirements. All chemicals used on Parks property will have an MSDS on file, and will be available to all staff, contractors and the public upon request.
- Pesticides shall not be used to control plants with edible fruit during the fruiting season unless the plant being controlled is not of sufficient size to produce fruit. Fruiting plants such as blackberries should be first cut to the ground, allowed to re-sprout and then chemically controlled before the plant can produce fruit. Plants controlled in this manner should never be allowed to produce fruit in the future.
- All sites where pesticides have been applied shall be posted, as required by the Washington State Department of Agriculture (WSDA). As required by the WSDA, all applications of pesticides will be recorded.
- When pesticides are used in confined environments such as greenhouses, the facility shall be clearly posted "Closed to Entry" until the re-entry time period has elapsed.
- Parks will continue its aggressive training program for all staff who apply pesticides, and will continue to emphasize learning new pest control techniques, as they are available.
- Parks will continue to field test alternative controls to pesticide use and will implement successful control options as budget allows.
- To promote public understanding and support of the benefits of the IPM program, educational assistance and information will be provided to the public regarding the use of pesticides.
- The City shall comply with all Federal, State and Local regulations pertaining to the application, handling, storage, and disposal of pesticides

Components of an IPM Program

IPM involves a structured decision-making process that embodies the philosophy and components of the IPM system. Through the following applications, as well as the proceeding guidelines, a well managed IPM program can be implemented.

- 1. Identification of pest populations:** Identify the nature, location, scale and the intensity of the problem.
- 2. Determine plant injury levels:** Define the tolerance levels for aesthetic and economic injuries. Prescribe the point at which actions must be taken to avoid exceeding the tolerance level.
- 3. Design and implement the pest management treatment:** Research all possible options and design strategies. Non-target organisms must be considered at this time. Use of pesticides is limited to situations where other cultural and biological options are not likely to be successful within the context of available resources. The pesticide chosen shall be the least toxic of those available and with the minimal of impact, as defined by that chemical's use.
- 4. Evaluate results.** Conduct follow-up inspections to support evaluation:
 - Did the pest population decline to acceptable levels?
 - Was there a negative impact on non-target organisms?
 - Do the host plants appear to be able to thrive following a successful treatment?
- 5. Adjust and extend program as indicated.** Decide whether further treatment will be necessary, either on a temporary or permanent basis. If it will be on a permanent basis, plan potential site modifications to eradicate the problem or prevent future recurrences.
- 6. Create documentation of all research, monitoring, and application data.** A comprehensive system of forms for monitoring data and documenting treatment is a key component of a successful IPM program.
- 7. Share pest management information with decision-makers and maintenance staff.** Professional staff must know the degree to which landscape pest management programs impact existing staff, maintenance budgets, and park assets. Only through such understanding and ongoing communication can the best long-term strategies be developed for managing pest populations.

IPM Alternatives Selection Hierarchy

The following selection rationales are used as a guide in determining whether pesticides shall be used in place of other control methods:

- Proper planning and management decisions begin the IPM process.
- Cultural methods of vegetation and pest control are preferred and will be employed first.
- If unsuccessful, mechanical means of vegetation and pest control will be employed next where feasible, and then,
- Biological means of vegetation and pest control will be employed next where they are practical and feasible.

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- Pesticides will only be used when no other feasible method exists that will control the pest within the realities of the location, site conditions, budget and other relevant considerations. At the same time, it is recognized that pesticide use is a legitimate element of an IPM program.

2.4 Best Management Practices

Storage and Use Guidelines

Every employee has a personal responsibility to themselves, other staff, and the public to follow safe work practices when storing or using pesticides.

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- Always read the label of the chemical that you will be using.
- Store and handle all chemicals or fertilizers in a manner that minimizes worker exposure and potential for contamination of surface and ground water.
- Always have the correct Material Safety Data Sheet (MSDS) on hand for all chemicals or fertilizers at your site (required by law).
- Always check the MSDS for the type of protection needed and the recommended re-entry time before the chemical is applied.
- When possible, purchase the smallest amount of any pesticide needed and avoid stockpiling of chemicals.
- Store fertilizer in a separate weatherproof area.
- All spray equipment shall be maintained in proper working order and stored in an OSHA-approved site.
- All protective gear (masks, filters, rain gear) will be stored separately from any possible contamination.
- Store and mix all chemicals in a WSDA-approved storage and mixing area. Label storage area with an NFPA-coded sign to protect Fire Department or Hazmat personnel in case of emergency.
- Any pesticides in inventory that are no longer needed for use will be disposed of through hazardous materials disposal practices.
- A pesticide inventory is maintained by the Resource Management Division.

2. Pesticide Application Equipment

Pesticide application for all listed areas will be carried out by hand with directed, low-volume, single-wand sprayers, wiping, daubing and painting equipment, injection systems, or drop spreaders. Typically, applications are done with backpack sprayers, but may also include sprayers with larger fill tanks providing the same kind of hand application method is used. These methods of delivery result in low-volume applications at low nozzle pressures. This practice minimizes the formation of fine mists that can result in pesticide drift. These practices also help ensure that the pesticide applied will reach only its intended target. In large open turf areas, boom type sprayers may also be employed. Boom sprayers are efficient and expedient, used to destroy weeds species after they have exceeded the acceptable threshold level.

3. Personal Protective Equipment (PPE)

The table on the following page shows the personal protective equipment required by City, state and federal regulations for pesticide use.

4. Chemical Application near Watercourses & Aquatic Habitats

Generally, the use of chemical products within 50 feet of a watercourse shall be prohibited in favor of an alternative control method. If a pesticide or herbicide must be applied within the 50 foot buffer, only products registered for use near water bodies shall be used, and great care will be taken to ensure that the product does not migrate into the watercourse either through drift or by overland flow. Weather conditions must be monitored carefully to avoid applying a chemical near a watercourse immediately before heavy rains. Soil conditions and site topography must also be carefully studied to determine the appropriate timing of a chemical application **and/or whether a chemical should even be applied at the site.**

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| Personal Protective Equipment (PPE) Guide for Using Pesticides | | | |
|---|--|---|--|
| Form of Pesticide | LABEL SIGNAL WORD | | |
| | Caution | Warning | Danger |
| Dry | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • shoes & socks | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • shoes & socks • wide-brimmed hat • gloves | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • shoes & socks • hat • gloves • cartridge or canister respirator if dusts in air or if label precautionary statement says "Poisonous or fatal if inhaled" |
| Liquid | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • shoes & socks • wide-brimmed hat • gloves | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • shoes & socks • wide-brimmed hat • rubber gloves • goggles if required by label precautionary statement • cartridge or canister respirator if label precautionary statement says "Do not breathe vapors or spray mist" or "Poisonous if inhaled" | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • rubber boots • wide-brimmed hat • rubber gloves or face shield • canister respirator if label precautionary statement says "Do not breathe vapors or spray mists," or "Poisonous if inhaled" |
| Liquid when mixing | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • shoes and socks • wide-brimmed hat • gloves • rubber apron | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • shoes & socks • wide-brimmed hat • rubber gloves • goggles or face shield; • rubber apron • Respirator if label precautionary statement says: "Do not breathe vapors or spray mist" or "Poisonous (or fatal or harmful) if inhaled" | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • rubber boots • wide-brimmed hat • rubber gloves • goggles • rubber apron • canister respirator |
| Liquid (prolonged exposure to spray, or application in enclosed area) | <ul style="list-style-type: none"> • long-legged pants • long-sleeved shirt • boots • rubber gloves • waterproof wide-brimmed hat | <ul style="list-style-type: none"> • water-repellent long-legged pants & long-sleeved shirt • rubber boots • rubber gloves • rubber apron • waterproof wide-brimmed hat • face shield • cartridge or canister respirator. | <ul style="list-style-type: none"> • waterproof suit • rubber boots • rubber gloves • waterproof hood or wide brimmed hat • face shield • canister respirator |

(source: City of Seattle Parks and Recreation)

2.5 IPM Best Management Practices

Parks maintains a wide variety of landscape types, each with unique pest control issues and control measures. For these reasons, the pest control measures specific to each landscape are dealt with separately in this section. If chemical applications are required, only chemicals approved for a specific location will be used in that location. Parks only uses City approved chemicals on park properties.

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Control of Special Pests

- **Blackberries** – An aggressive, invasive plant, blackberry will overtake a disturbed site at an alarming rate. Mechanical control is not very effective by itself. But combined with chemical control measures and replanting of the site, effective control can be maintained. Chemical applications shall be kept to the area of infestation. Treatment efforts should include revegetating the site with desirable plant species.
- **Scotch Broom** – An unruly plant, it thrives on disturbed sites. It is difficult to control, and spreads rapidly. The seeds and flowers are toxic, making it a high priority for eradication. Manual control can have some effect, but it must be done at the proper time of year. Chemical control can also be effective, but requires follow up management techniques until full eradication occurs. Chemical applications shall be kept to the area of infestation.
- **English Ivy** – A very aggressive, invasive, introduced plant, Ivy is difficult to control or eradicate. Manual or mechanical control is somewhat effective, but highly time consuming. A combination of mechanical and chemical control is more effective, and spread can be kept to a minimum, with continuous control measures. Chemical applications shall be kept to the area of infestation.
- **Horsetail** – One of the most tenacious weeds in the Northwest gardens is horsetail. It is almost impossible to control manually or mechanically. Horsetail can be controlled with herbicides. As with other chemical controls, chemical application shall be contained to the area of infestation. Horsetail is an indication of high water content in soil, so any use of herbicides should be well thought out and carefully timed.
- **Garden Slugs** – As in all Northwest gardens, garden slugs can have a significant impact on park floral beds. Approved control strategies include manual control and careful use of chemical control products. One non-toxic chemical that is found to work is iron phosphate, which is biodegradable and is even healthy for garden soil.
- **Rats** – Rats are only somewhat of a pest problem in Bellevue parks. Bellevue does have some natural predators of rats which helps alleviate many of the problems that could occur. They do pose a human health risk and will be controlled in given situa-

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Notes:

tions. The common method of control is baiting with an approved rat bait/trap. Extreme caution must be taken to place rat bait in locations where people or domestic animals cannot access it.

- **Mice** – Mice are becoming an increasing human health problem from Hanta virus. Mice control is not currently a major pest control issue in Parks facilities, but increased control measures may be required in the future based on the history of the virus.
- **Yellow Jackets, Hornets, and Wasps** – These insects often require control in parks. Control is typically through use of an approved insecticide. Only individual nests are treated and only if the nest poses an imminent risk to humans using park facilities.
- **Vector-borne Disease** – Here in the Pacific Northwest, vector-borne diseases are only starting to become an issue. The most significant is mosquito-borne diseases, such as the West Nile Virus. Complete control of mosquito infestations is near impossible, but cultural control can have some effect, such as removing any standing-stagnant water from any sites. Larvicides may also be used to control mosquito infestations if it's determined that public health concerns warrant their use.

IPM for Greenhouse Operations

Greenhouses are a production operation dealing with large numbers of plants, of similar species, in a closed, non-public environment. Because of these factors, the tolerance threshold for many pest problems is much less in the greenhouse environment than it is in general park landscapes, requiring the use of a broader palette of pesticide products.

Pest Tolerance Thresholds

- Weeds are not tolerated in the City greenhouse.
- Insects or disease pests that threaten the health of plant collections or production crops are not tolerated in the greenhouse.

Pest Management Strategies

Weed Control

- Greenhouse operating areas and containers and conservatory display spaces shall be kept free of weeds through hand/manual weeding.
- Weeds shall be controlled in exterior spaces, building perimeters, shade houses, cold frames and related areas either by hand or mechanically with push type mowers and string trimmers or suppressed with landscape fabrics.
- Exterior areas shall receive pesticide treatments for weed control, if they impact interior production.

Insect Control

- Insect pests shall be routinely monitored by visual inspection or the use of "sticky traps."
- Cultural practices including regular irrigating and fertilizing shall be used.

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- Insects should be removed by hand or washing them off the affected parts of the plants.
- Biological controls, such as beneficial insects and other organisms that attack pest insects should be used to keep pest populations under control. Periodic release of beneficial insects helps to suppress and reduce the need for chemical control.
- Spot treatments of the least toxic, yet effective, insecticide shall be directed at specific plant parts for specific pest control.

Notes:

Disease Control

- Good sanitation techniques shall be provided, including regular removal of plant debris and keeping tools and work areas clean.
- Plants shall be properly spaced to provide for good air circulation.
- Disease resistant plants shall be selected.
- Diseased plants shall be kept away from healthy crops.
- The least toxic, but effective, pesticide product shall be applied to control specific disease pathogen on a specific plant or crop.

IPM for Nursery Operations

The nursery, located on SE 16th Street, is a facility for the growing of plants for use on developed and undeveloped park property. It occupies roughly five acres of property and has been in continuous operation for more than 30 years. The plants provided by the nursery operation include natives as well as ornamentals, groundcovers, vines, perennials, shrubs and trees. The plants are grown to support various needs throughout the park system from small in-house planting projects to large Capital Improvement Projects. In recent years, the production of native plants has been increased substantially to meet increasing demand, primarily for forest restoration projects. Control of pests in the nursery environment is very important since many plants may be affected at one time.

Pest Tolerance Thresholds

- Pests that threaten the health of the nursery crops will not be tolerated and will be controlled.

Pest Management Strategies

Surface and Groundwater Protection

- General site runoff is controlled through biofiltration.
- Select the least toxic and most non-leaching chemical products only when necessary. Precisely follow all label instructions.

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Notes:

Weed Control

- Most weed control at the nursery is accomplished through hand weeding, mulching and use of landscape fabrics
- When other controls have failed, herbicide is used for spot control of weeds.

Insect Control

- Habitat for natural insect pest predators will be encouraged as an environmentally sound means to reduce populations of insect pests.

Disease Control

- Select disease-resistant plant varieties.
- Monitor plant crops for disease outbreaks.
- Practice good cultural practices including watering, fertilizing, pruning and maintaining good air circulation.
- Reduce the potential for transfer of disease through good sanitation techniques. These practices include keeping growing areas, tools and containers clean and removing plant litter and debris in a timely manner.

IPM for Plant Beds

Plant beds are defined as non-turf planted areas that include woody plant material such as shrubs and trees and ground covers. The category also includes floral color displays containing herbaceous plants such as perennials, annuals, and bulbs. The most serious pest management issue in plant beds is weed control. If not controlled, weeds not only make a plant bed look unkempt but, more importantly, can out-compete desirable landscape plants resulting in a loss of assets. Tables 1 and 2, respectively, show pest tolerance thresholds and IPM principles that shall be employed in selecting maintenance methods for plant beds.

Pest Tolerance Thresholds

- In general, weeds are not tolerated in park plant beds.
- Insect pests are tolerated, unless they pose a threat to humans.
- Diseased plants are not tolerated and are usually removed.

Pest Management Strategies

Weed Control

- Weeds are controlled by hand pulling, or by mechanical methods in larger plant beds.
- Plant beds will be mulched after planting to suppress new weed growth.
- Use of landscape fabric can be used.
- Herbicides can be sprayed, if necessary.

Disease Control

- Diseased plants shall be hand pulled from plant bed and discarded appropriately..

- Disease resistant plants shall be planted in all parks plant beds, whenever possible.

IPM for Trees

Trees are an integral part of most landscapes, whether formal or natural, and are considered an asset. They provide shade, clean the air of pollutants, modify both micro and macro climates, and provide visual relief to the urban environment. Because trees are often very large and tall, accessing and managing insects and disease can be quite difficult and costly.

Pest Tolerance Thresholds

- In general, insect and disease pests in trees are tolerated
- Insect or disease pests in selected, high-value specimen trees may be subject to control measures.

Pest Management Strategies

Physical Damage to Trees

Physical damage to trees can be a major factor in overall loss of trees. This damage most often occurs in one of two ways. One is when trees are repeatedly struck by mowing equipment. A second form of injury is by string trimmers, which can damage bark leading ultimately to tree loss. Many trees are also lost to lack of appropriate care during construction projects within existing parks.

- Removing turf from around the tree base to create tree mulch rings 3 to 4 feet in diameter can substantially reduce damage caused by mowers and trimmers. With tree mulch rings, a mower or trimmer never has to come close enough to the tree to cause damage. The tree mulch ring will need to be kept free of grass and weeds.
- Following the BMPs in Section 1, Construction Site Management, substantially reduces or eliminates damage from construction activities.
- All pruning for tree health reasons and for hazard reduction will be done in conformance with the International Society of Arboriculture standards.

Insect Control

Parks does not actively control insect pests in trees. This is particularly true of large trees where the control of the pest might require the use of large aerial spray equipment, which carries with it a high probability of the insecticide applied leaving the area due to wind drift. For example, Parks does not spray aphids despite the “honeydew” problem associated with them. When insect pests are controlled in trees, the following measures are used:

- Trees that are highly susceptible to specific insect pests (such as blue spruce and spruce aphids) may be removed from the landscape and replaced with resistant species.

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- When possible, the portion of the tree affected by the insect (such as tent caterpillars) can be physically removed, eliminating the pest.
- An insecticide may be applied to control a specific insect pest in very selected situations. These situations include pests on specimen quality trees at special gardens or in high visibility locations where the presence of the pest threatens the life of the tree. In these situations, general foliar applications will not be made unless the potential for product drift can be controlled.
- New injection technology may allow for systemic control of certain insect pests with minimal or no impact to human or environmental health. Parks will continue to explore this technology as a potential control in the future for insect pests that may threaten the health of valuable park trees.

Disease Control

Dutch Elm Disease and anthracnose on London Plane Trees are the only tree diseases Parks actively controls with pesticides. Most other diseases are tolerated in trees, unless they lead to a tree becoming a hazard to the surrounding environment. As with insecticides, it is unlikely that Parks will subscribe to general foliar applications of fungicides or similar pesticide products to control disease pests in trees. The following are control measures that can be performed:

- Trees that are susceptible to particular disease pathogens may be removed from the landscape and replaced with resistant varieties.
- When possible, parts of trees affected by disease should be pruned out and properly disposed to stop the spread of disease within the tree and to adjacent trees.
- An appropriate fungicide may be applied to control a specific disease pathogen in very selected situations. These cases include specimen quality trees in special gardens or in high-visibility park locations where the presence of the disease threatens the life of the tree. In these situations, general foliar applications will not be made unless the potential for product drift can be controlled.
- New “injection” technology may allow for systemic control of certain disease in trees pests with minimal or no impact to human or environmental health. Parks will continue to explore this technology as a potential control for disease pests that may threaten valuable trees in City parks.

IPM for Turf

The City of Bellevue Park system maintains a wide variety of turf types. These include park lawn areas (both formal and informal), athletic fields, golf courses, meadow areas and other turf types. Each of these turf types has different pest management challenges, and practices may vary accordingly.

Pest Tolerance Thresholds

- Some level of weed, insect, and disease pests are tolerated in general park lawn areas.
- Pests in highly maintained turf such as athletic fields, bathing beaches and other high-visibility /high-use areas are generally controlled through good turf cultural practices.
- Because of the unique conditions present on golf courses, a variety of pest control measures are used, including mechanical, cultural and chemical.

Pest Management Strategies

Broadleaf Weeds

Weeds in turf are tolerated, to some level, with the exception of golf course turf and a few high-visibility park turf areas. When control is necessary, the primary method is through the following cultural practices:

- careful monitoring of watering practices
- fertilization
- aeration
- top-dressing
- over-seeding

By performing these cultural practices, park turf is made healthier and better able to compete with various broadleaf weeds. Chemical weed control will be used only as a last resort for controlling particularly difficult weeds in high-visibility turf areas.

- In these limited situations the least toxic, least residual pesticide will be used for spot treatments.
- General broadcast treatments will generally be avoided.
- Timing of such applications will be made to avoid contact with the public to the extent possible.
- Posting of the site that has been treated will meet or exceed legal requirements.

Maintenance for the City's golf courses generally does have to control for broadleaf weeds. This control is done through cultural practices and spot application of carefully selected herbicides.

Insect Control

The only real insect pest currently of significance for turf in the Bellevue area is the European Crane Fly. While it can be quite damaging to turf areas, the crane fly is not controlled by prophylactic means in City of Bellevue parks.

- Chemical control is used only in the very limited circumstances to turf of very high visibility and value such as golf course turf and selected high-visibility /high-use park turf areas.
- Any chemical applications will be spot treatments directed specifically at the turf areas containing the pest.
- The preferred initial choice for application in high-use areas is the "safest" or least toxic product available.

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Disease Control

General Park Turf. Disease in general park turf is typically tolerated and not actively controlled.

- In high-use/high-visibility park turf areas, disease will be controlled to a considerable degree by performing sound cultural practices.
- Pesticides may be used as a last resort to control disease in park turf areas.

Golf Course Turf. Because turf disease can be a significant problem on golf courses, it must be controlled to preserve the function of this asset. Golf course turf, particularly greens and tees, must perform under extreme conditions of maintenance and use. These conditions make golf course turf more susceptible to disease than general park turf.

- Golf turf disease is controlled through good cultural practice to the extent possible.
- Certain diseases are controlled through the application of an appropriate fungicide.
- When used, fungicides are applied to the diseased turf only, such as a green.
- The least toxic and still effective products are used.
- The fungicide used will be rotated yearly to reduce the chance of the turf disease developing a resistance to the chemical control.

Grass Trimming Abatement

The control of grass growing along fence lines and around trees, bollards, posts and other landscape features is a regular maintenance activity that helps preserve the asset by allowing large riding lawn mowers to steer clear of objects. This is especially important around trees where impact from mower damage can easily lead to tree loss. At the same time, keeping this grass controlled allows Parks to present parks that appear clean and well kept. This grooming affects how the public uses our facilities. Well-maintained parks are subject to less vandalism and related misuse. The following are BMPs for grass trimming:

- **String trimmers or push mowers.** The grass is trimmed using gas-powered string trimmers or push-type lawn mowers. This labor-intensive practice is costly and produces noise and air pollution.
- **Herbicide.** Applications are performed annually or semi-annually, to provide pre-emergent control of weed and grass seed not yet germinated in tree mulch rings, plant beds and similar areas.
- **Concrete mow strips.** As resources are available, it is sometimes possible to provide a “mow strip” of concrete or a similar low maintenance product around some landscape features to eliminate the need for grass trimming. This control option is costly and doesn’t work in all situations.

IPM for Natural and Sensitive Areas

Natural areas are City-owned property with critical environmental resources. These sensitive habitats shelter native ecosystems and wildlife habitat and include nearly all classifications in the *City's Sensitive Areas Manual*, including steep slopes and slide prone areas. For the purposes of this BMP manual, these resource assets are divided into three major groups:

- Wetlands, riparian corridors, shorelines and aquatic habitats
- Forests
- Meadows

Pest Tolerance Thresholds

For all natural and sensitive areas:

- Invasive plants are generally not tolerated. Invasive plants will be controlled in conjunction with natural resource enhancement efforts in these environments as resources permit and where control can be practically achieved.
- Noxious weeds will not be tolerated and will be controlled when found in conformance with State of Washington mandate. For more information on noxious weeds, visit the following web-site: <http://splash.metrokc.gov/wlr/LANDS/Weeds/index.htm>
- Only insect pests that pose a risk to the public (such as hornets) or to the resource (such as gypsy moth) will be controlled.
- Plant diseases will generally be tolerated unless: a specific control can be employed that will be effective in ensuring the health of particularly valuable assets; or if they pose a threat to other plant populations outside of the natural area; or if they pose an unacceptable risk to the public.
- **Herbicide Use:** The use of herbicides in any natural environment must be carefully considered. Herbicides will be used for weed control in natural areas only when other control measures have been tried and failed, and only if control can be achieved through the use of a herbicide, and is imperative to the health of the site. For wetland or water environments, only approved wetland herbicides will be used.

When needed, herbicide use practices are as follows:

- Cut and stem treatment (daubing or painting) is the preferred choice for natural area management.
- Certain invasive plants are difficult to treat and control in their mature form. If possible, remove existing growth manually or mechanically. Wait for new growth to become established. Then treat with the appropriate and approved herbicide.

Pest Management Strategies

Weed Control

An overriding principle of IPM is the maintenance of healthy plant communities. That means weed control of the following types:

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- **Timed mowing.** Carefully timed mowing before seed set can effectively reduce weed seed sources. Frequent mowing can eliminate blackberry and other woody species.
- **Mulching.** Mulching around the base of plantings is widely accepted as a horticultural practice for soil fertility and weed control. In most instances, composted wood chips or onsite recycle leaf litter are adequate materials. Avoid wood chips from diseased trees. Mulch should be between 2 to 3 inches deep for best results.
- **Weed watch during mulching.** Care must be given to not incorporate new weed problems when importing mulch materials.

Woody Brush Control

The control of woody brush, like blackberry, is very important in certain park locations. Often these plants are found in transition areas between developed park areas and natural areas. If not controlled, woody brush can easily over take forest-edge environments, eliminating vital habitat opportunities. Control measures for woody brush include the following:

- Manual or mechanical removal using hand tools or gas-powered equipment. Special tools are now available for removing woody brush. In many areas, this can provide effective control.
- Chemical control can be employed when other measures are not mechanically or economically feasible. Spot applications are preferred, whenever possible, to large area applications.

Insect Control

Insects like the European and Asian Gypsy moth and the Asian Long Horned Beetle can potentially devastate Bellevue's urban forest. Parks will cooperate with state and federal agencies in their monitoring and control programs to prevent the introduction of these pests.

Disease Control: Root Rots

Even native forests can have serious disease problems. Root rots are the most serious problem, leading often to the death of significant trees. Several strategies help control root rot in forests:

- inoculate with mycorrhizae
- remove infected wood
- plant resistant varieties
- treat resulting stumps with borax on Western Hemlock
- do not change site conditions on mature trees

Stump Re-Sprouting Control

Often there is a need to remove small trees and prevent re-sprouting of a stump. Methods for controlling the re-sprouting of stumps include the following:

- If the location of the stump(s) will allow access by equipment, then they can be mechanically removed providing the location is not within an environmentally critical area.
- Small stumps may be removed manually providing they are not on steep slopes or in other environmentally critical areas.
- The re-sprouting of stumps can also be controlled by painting newly cut stump surfaces with an herbicide. Care will be taken to limit the application of the selected herbicide to the stump surface only.

Notes:

Invasive Plant Control

Invasive plants have taken over many of the City's forested areas and have radically and negatively impacted pre-existing ecosystems. Attaining long-term control of invasive plants is essential to the recovery and preservation of Bellevue's natural ecosystems. Invasive plant control shall follow the guidelines established by *King County Noxious Weed Boards*. Except in the case of Class A weeds, the goal is suppression of weed populations to below threshold (damage causing) levels. Eradication of certain ecological weeds (blackberry or ivy) in all of the City's natural areas is neither feasible nor cost-effective. However, controlling spread of the problem and eradicating it in certain priority locations are Parks goals. Control methods include:

- Use *extent of removal* and *type of habitat* to determine the pest control method.
- Large areas that are totally infested can be mowed. Areas that are interspersed with invasive pests require more selective procedures such as manual removal.
- Heavy equipment or manual removal can be used on firm soils. On either steep or saturated soil, use techniques that will minimize site or slope disturbance.
- Where mechanical or manual removal is neither possible nor practical but control is essential, careful and selective use of an approved herbicide is permitted. Use of these chemicals shall conform to the guidelines listed below in "Herbicide Use."
- Re-establishing a new native planting regime as quickly as possible following the removal of invasive plants is critical to successful forest restoration. These new plantings will require care for several years to guarantee establishment.
- Preserve established native plants when possible rather than reestablishing new plants after the clearing of invasives.
- Public education and outreach concerning plant identification and management techniques will also aid the City in controlling noxious weeds.

Nuisance Wildlife Control

Mountain beavers, moles, coyotes, beavers, opossums, raccoons, waterfowl and other species can be destructive to natural areas when their activities are excessive. Overall, Parks does not encour-

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age the interference with wildlife, and prefers to leave them to their natural behaviors. If control of wildlife is deemed necessary, Parks will work with the most appropriate city (Animal Control) or state (Department of Wildlife) agency to formulate a control solution.

IPM for Trails

Pest Tolerance Thresholds

- Invasive plants that invade the trail area are generally not tolerated. Invasive plants will be controlled in conjunction with ecosystem restoration efforts on any park trail as resources permit.
- Noxious weeds will not be tolerated and will be controlled when found in conformance with State of Washington mandate.
- Weeds are generally found on trails and many will be tolerated. Weeds that begin to form a hindrance of trail function will be eradicated.
- Only insect pests that pose a risk to the public (e.g. hornets) will be controlled.

Pest Management Strategies

Weed Control

Weeds on trails are generally tolerated, until they begin to interfere with trail function. When control is necessary, the primary method is increasing mulch on, or re-surfacing, trail surface

Chemical weed control is often not necessary on trail surfaces, but will be used only as a last resort for controlling particularly difficult weeds.

- In these rare situations the least toxic, least residual herbicide will be used for spot treatments.
- General broadcast treatments will be avoided.
- Timing of such applications will be made to avoid contact with the public to the extent possible.
- Posting of the site that has been treated will be done as legally required.

Insect Control

Overall, insects on trails are tolerated. Only insects that can cause a health risk are controlled. Wasps and hornets are some of the few insects that will be eradicated immediately when encountered. When this is necessary, chemical control, with an approved insecticide, is the preferred method, and only the individual nests will be treated.

IPM within Agricultural Areas

Pest Tolerance Thresholds

- Invasive plants that invade agricultural areas are generally not tolerated. Invasive plants will be controlled as resources permit.
- Noxious weeds will not be tolerated and will be controlled when found in conformance with State of Washington mandate.
- Weeds are generally found in agricultural areas and many will be tolerated. Weeds that begin to interfere with crop production will be eradicated.
- Only insect pests that pose a risk to the public (e.g. hornets) will be controlled.

Pest Management Strategies

Weed Control

Generally, weeds are tolerated in the agricultural areas. When control is necessary, mechanical practices are the primary methods.

- mowing
- hand pulling
- herbicides are used only in extreme cases.

Insect Control

Insects are not a high concern on Parks farms. In the past, there has been little need to utilize insecticides, except in the case of hornets nests. When a minor insect breakout occurs, Parks has used surfactants, but in the future, if insects problems become prolific, Parks may consider other options of control.

Disease Control

Most agricultural areas owned by Parks are on wetlands. Disease issues related to that kind of environment make control more difficult. At the present time, only fungicides approved for a wetland environment have been used to counter diseases such as “mummy berry”, a serious disease on blueberry farms. The following control measures may be performed in order to prevent spread of diseases:

- drainage of crop rows to reduce root rot
- spot application of an approved fungicide. In these situations, general foliar application will not be made unless the potential for product drift can be controlled.
- clean cultivation or tilling of the soil around crop plants to bury mummified berries to 1 inch will help prevent the disease from spreading in the following year.

Fertilizer Use

Parks does not use fertilizers on any agricultural lands.

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Nuisance Wildlife

There is some need for control of nuisance wildlife on Parks owned agricultural lands. Most of the farms grow fruits, which are highly appealing to many wildlife populations. Most grazing by wildlife is tolerated, with the exception of Starlings. They pose a major detriment to the farm as they can consume large amounts of foods, and are very abundant. The Starling population has risen to such a level that extreme measures of control have been considered. Presently, Parks uses bird calling machines placed throughout the farm areas, as a deterrent to Starlings and other birds.

2.6 Training

Because IPM is an ecologically sophisticated process that requires professional expertise in vegetation and pest management, it demands trained field personnel that are knowledgeable about:

1. Ecological interactions and relationships among vegetation and pests;
2. Potential tools and materials that can be used to effectively manage vegetation and pests by manipulating environmental conditions; and
3. Correct timing for implementing specific management practices relative to vegetation and pest biology.

Educational and career opportunities in IPM will enhance crew professionalism, their knowledge of current vegetation and pest management practices, and their stewardship of managed landscapes. Each landscape type will have an individualized training program developed and accessible to all applicable staff.



Chapter 3 – Irrigation and Water Management

Water resources are an important part of the Parks & Community Service Department landscape assets. Turf, shrubs and trees all require water to live, but not all require the same amounts. Wise water use must consider both the preservation of landscape assets and the impact on the broader watershed. An efficient irrigation program makes the best use of the resource by not wasting water vital to other natural resources such as fish while at the same time preserving landscape assets.

The design and programming of irrigation systems is complex. It requires knowledge of designing hydrozones, basic hydraulics, site conditions such as soils, slopes and plants, and a knowledge of the irrigation system tools themselves. As competition for available water becomes more acute, the department will continue to be equally dedicated to carefully managing this resource.

3.2 Definitions

Evapotranspiration — The loss of water from the soil, by plants, through the process of both evaporation and transpiration.

Water management — Term for the efficient use of supplemental irrigation water required for most landscapes in the Puget Sound region.

3.3 Background

Best management practices for irrigation system operations combine activities for maximizing a range of technologies for water control and common field practices. (Note: all irrigation systems are designed and installed in compliance with City of Bellevue’s water budget requirements.)

Irrigated Park Areas

Because our mission is to preserve all landscape assets, most developed landscape areas are irrigated, including the following:

- Athletic fields
- Community and neighborhood parks
- Golf greens, tees, and fairways
- Most turf areas
- Most shrub and annual plant beds
- Newly installed landscapes
- Streetscapes
- Most areas in high-use or high-visibility parks
- Special gardens
- City building facilities

Non-Irrigated Park Areas

The following City facilities are not irrigated:

- Meadow areas
- Natural areas
- Low visibility and low use turf areas

Notes:

3. Irrigation & Water Management

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Design

Irrigation design is the foundation of sound water management. The design process involves determining which sites to irrigate, what portions of each site should be irrigated, and choosing the appropriate automated system.

Choosing an Automatic Irrigation Control Option

The City of Bellevue utilizes a variety of controllers for timing the application of irrigation water. These automatic controllers serve three primary purposes:

- Operate remotely rather than manually, saving labor hours and water
- Accurately time irrigation to specific needs of soils, slopes and plants
- Reduce impacts to park use and water loss to evaporation by operating at night

Providing Manual Backup for System Operation

All newly designed or renovated automatic irrigation systems should have manual backup capacity for operation in the event of a breakdown or failure in the automatic system.

Types of Irrigation Controllers used in Bellevue Parks:

- Solid State
- Battery Powered
- Solar Powered
- Maxicom

- 1. Solid State Controllers.** These controllers use solid state circuitry. Advantages of solid state controllers include relatively low cost, significant programming flexibility and ease of repair. The only disadvantage of these controllers is that solid state operates as individual units, thereby lacking the savings potential of central computer control. Solid state is the preferred controller for parks that will not be connected to central control.
- 2. Battery-Operated Controllers.** Battery-operated controllers are either mechanical or solid state controllers that operate off batteries. They are typically used at locations where automatic irrigation is desirable but access to electric power is not feasible. The City uses very few of these devices currently as constant monitoring is required to make the systems reliable. Batteries are subject to failure and moisture problems, requiring regular replacement.
- 3. Solar Powered Controllers.** Solar powered controllers utilize solar energy to provide power for the controller. This technology is relatively new and requires the use of on-site solar panels which are susceptible to vandalism and misuse.
- 4. Maxicom.** Maxicom is the brand name for a centralized computer-controlled irrigation system that the City uses at those parks where communication linkages are possible. Maxicom allows remote irrigation systems to be programmed. It monitors water use within individual systems and can detect problems and pin-

point them for repair. Because the system is linked to a weather station, it can be programmed to withhold water on rainy days. Maxicom can also shut the system off when soil moisture levels indicate watering is not needed. These built-in sensors determine where water is being used and where there may be problems. It is the preferred computerized control system for the majority of the City's park sites. Maxicom also employs various sensors such as flow meters and sub-meters within the irrigation systems. This system requires daily monitoring by a trained technician who can make appropriate changes based on weather conditions.

The Maxicom system, while a great tool, is complicated. Only sufficiently trained staff should program and operate Maxicom controllers.

In an ideal world, all automatic systems would be operated through centralized computer controls. Use of Maxicom for medium to large parks and athletic fields is very important and should continue to be a high priority.

Notes:

Installing Irrigation Systems

All new irrigation systems and renovations shall be designed and installed according to departmental standard specifications, and shall comply with the City of Bellevue's water efficiency and irrigation regulations and codes. A water budget must be prepared and approved by the Utilities Department. To the extent possible, standard material and products will be used to increase ease of maintenance and reduce inventory confusion and incompatibility problems.

Programming Automatic Irrigation Controllers

Programming automatic irrigation controllers relies more on understanding a site and its plant materials than the mechanics of the system itself. Controllers should be checked bi-weekly to ensure proper operation to maximize watering efficiency. The primary goal of using automatic irrigation controllers is to maintain a consistent soil moisture environment that maximizes plant health and vigor, while closely monitoring water use, so as to not needlessly expend resources.

Water Auditing and Conservation

To ensure the City's automatic irrigation systems are designed and operated in a way that results in optimal plant health and efficient use of water resources, the Parks Department regularly performs Water Audits. A Water Audit strives to determine if the water used on a given site exceeds, meets, or fails to meet the needs of that site based on plant species, soil types and weather conditions. The Parks Department relies on both contracted Certified Irrigation Water Auditors and in-house landscape professionals to perform these evaluations. Usage adjustments are made if a water audit shows that efficiencies can be gained with little or no impact to the plant resources.

During drought seasons, the City of Bellevue follows a water shortage management plan which is based on the voluntary curtailment

3. Irrigation & Water Management

of water usage by Bellevue residents, as well as a 50% reduction in normal irrigation usages on City property. For a detailed description of the City of Bellevue, Parks and Community Services Department's Water Shortage Response Plan, see appendix. The Parks Department, in cooperation with the Utilities Department, also adheres to the City-wide Water Shortage Contingency Plan, adopted in 1994. (see appendix) Water restrictions are kept in effect until resevoirs are returned to a safe level, and water quality testing has proven the water safe to drink.

| To Program a Non-Maxicom Automatic Irrigation Controller: | |
|---|---|
| Component | You Should Know: |
| Irrigation System | <ul style="list-style-type: none"> • Daily amount of water discharged. Most important is the amount of water the system discharges in gallons per minute (gpm) and how that translates into "inches of water per week." • Daily multiple programming ability. Some controllers allow for multiple programming daily; others don't. Certain sites, such as those with steep slopes, may require multiple programming. • Capabilities of each system. Each type of controller operates slightly differently. Know enough about the variety of products and their operation to select among them. |
| Site Conditions | <ul style="list-style-type: none"> • Soil conditions. Watering regimen differs from soil to soil. Sandy soils drain much faster than clay soils. Clay soils often will not absorb water very quickly. • Topography. The more sloped the site, the greater the potential for runoff. • Watering requirements of plants. Most sites are designed so that plants with similar water needs are grouped. Most lawns are on separate irrigation "zones" from plant beds because their watering needs differ. |
| Other Info | <ul style="list-style-type: none"> • Uses of site. Know how a site is used, including type of use, intensity, misuse potential (vandalism). • Various quirks in system or local water service. For instance, it may not be possible to get sufficient water volume during certain times of the day. • Fundamental problems with system itself. Check for and correct the following: <ul style="list-style-type: none"> -If the system has heads that are unsuited to the site, misaligned, or damaged. -If the controller needs capacity for multiple daily programming. |

| To Operate Maxicom Systems: | |
|-----------------------------|--|
| Step | Activity |
| 1. | Program the computer with site-specific information. This data is obtained through an on-site audit. This audit might be best done as a contracted service because staff time is often not available for such time-intensive processes. |
| 2. | Train the selected staff that will have access to the system. A certification course is available that staff will need to attend and complete. There are several levels of certification. In addition to this basic training, the selected staff will also need to attend additional training as the system evolves and changes. |
| 3. | Make sure the: <ul style="list-style-type: none"> • Weather station is up and operating properly • Evapo-transpiration information is accurate by checking weather reports and software programs • Various flow sensors and other system hardware are operational. |
| 4. | The fourth step is actual system operation. The system needs to be regularly monitored and followed-up, including writing work orders for system repairs. |
| 5. | The fifth step is maintaining documentation of the actual water use. Maxicom should, over time, show a reduction in water use at those sites where it operates and where the City of Bellevue has irrigated regularly in the past. |

(source: City of Seattle Parks and Recreation)

3.4 Best Management Practices

- Water use needs of the turf, shrubs, and trees shall be researched prior to irrigation. Apply no more water each week than required to sustain healthy plants. For turf areas, a general rule of thumb is no more than 1 inch of irrigation water per week, including rainwater.
- Turf should be watered 1 – 3 times per week, and for longer periods to promote deep rooting. Deep rooting leads to healthier, more drought-tolerant grass.
- Soil also plays an important role in irrigation. Soil conditions should be considered, particularly in turf areas with heavy use. Heavier, clay-type soils cannot be watered as long during each watering cycle as can sandy soils.
- Turf and planted areas should be aerated and cultivated to relieve soil compaction and increase water uptake.
- Wherever possible, watering should be avoided during the hottest part of the day. Watering at night is preferred to reduce evaporation of water as well as possible vandalism to equipment and irrigation heads.
- Staff shall not allow manually operated systems to apply water longer than needed. The system shall not be turned on in the morning and turned off at the end of the day for convenience.
- Special attention shall be paid to verify that manually operated sprinklers are actually watering the landscape and not streets or other non-landscape areas.
- A water budget should be determined for each site.
- A complete system audit should be completed on a 5-year cycle.
- Application of irrigation water shall be carefully monitored to determine when controller settings can be reduced to save water and to reduce runoff.
- A resource management system for irrigation operations should be developed. This system would provide a database from which programming records can be retrieved for annual system reprogramming to avoid starting from scratch.

Notes:

Other considerations for Irrigation:

- Consider plant species and age when programming the irrigation controller or when applying water manually.
- Site topography plays an important role in irrigation timing. Given their potential for runoff, sloped sites may require multiple applications of irrigation water in shorter timing cycles than required for flat sites.
- Site specific soil moisture holding capacity, and soil infiltration rate.
- Know what the water requirements of the plants are in each zone. Prevent OVER-watering.
- Attributes per station such as: slope, exposure level, soil type, and plant requirements.

3. Irrigation & Water Management

Notes:

Irrigation System Maintenance

The following are preventive maintenance procedures for irrigation system operations:

- Visually check the system to make sure it is operating properly.
- Perform regular preventive maintenance on heads, valves and controllers.
- Repair the system **promptly** to reduce water loss.
- Make sure heads are set at the proper grade and properly aligned.
- Make sure valves are operating properly.
- Use the system winterization and de-winterization processes as opportunities to make complete system visual checks.
- Keep grass and shrubs trimmed away from heads to allow proper functioning.
- Clean heads as needed to ensure optimum performance.

Upgrades and Replacements

- The existing inventory of the condition of all City irrigation systems shall be maintained and updated.
- A replacement program (major maintenance program) is needed to ensure timely upgrading or replacement of old systems. The existing irrigation system major maintenance replacement program shall be maintained to provide priority-based direction for replacement funding.

3.5 Training

Staff training is required in several areas:

Basic Water Conservation

All park maintenance and operations staff should receive training on basic water conservation as part of an overall training program in environmental management. City staff, vendors or state agencies can provide this training. Staff should follow the Parks & Community Services Department drought policy during periods of extreme regional water shortages. (see appendix)

Mechanical and Solid State Controllers

Programmers for the system are required to become familiar with the unique qualities of each controller. This training should be scheduled when controllers are installed or when unfamiliar with equipment. Training should include all field staff.

Maxicom

Operation of the Maxicom system requires training and certification. This training is provided by outside vendors.

- All maintenance staff shall hold a membership in the Irrigation Association.



Chapter 4 – Nursery Operations

The Resource Management Division provides about 16,000 spring and 14,000 fall plants per year. The nursery provides a cost-effective way for the City to meet landscape plant replacement needs throughout its park system. Strict operational practices are followed to produce high quality and healthy plants in City of Bellevue nurseries. This section identifies and defines these best management practices for nursery operation.

Notes:

4.2 Definitions

Clean green – refers to various plant debris such as leaves, pruned limbs, etc. that has not been contaminated with garbage and is suitable for recycling and composting.

Nursery – a facility for the propagation and growing of plants for use on developed and undeveloped park property.

Poly-house or shade house – terms for greenhouse-type structure that provides a minimal level of cold weather or sun protection required by nursery crops.

Senior gardening staff – resource management staff person responsible for managing the nursery. Senior gardeners are “journey-level” positions, possessing a broad range of horticultural knowledge and skills.

4.3 Background

The City of Bellevue operates a Nursery at 15302 SE 16TH St. The nursery occupies roughly 5 acres and has been in continuous operation for more than 23 years. The City Nursery holds ornamentals, ground-covers, vines, perennials, shrubs, and trees. The plants are grown to support various needs throughout the park system from small in-house planting projects to large capital improvement projects.

An increasing number of these plants are Pacific Northwest native species, grown for use in landscape restoration projects, to ensure variety of plants needed in the sizes required. The City nursery also produces an increasing number of annuals for most of the City’s plant beds and landscapes. The following are features of the City Nursery:

- office and storage building
- growing frames
- holding and healing-in area
- container yards
- poly- and shade houses
- propagation areas: cold frames, seed beds, poly-house.

Basic Operating Plan

- Most of the nursery operation is containerized. Plants are grown in containers to various sizes for eventual planting in parks. A containerized operation is both cleaner and less labor intensive

4. Nursery Operations

than field growing, particularly when moving plants out of the nursery.

- Plants are field grown to meet specific needs such as large specimen trees.

Notes:

Plant Selection

- The City of Bellevue's nursery program is not designed to carry a large number of plants in its inventory. Surplus plants are not cost effective given the care required to maintain a large inventory.
- The types and quantities of plants selected for propagation are generally determined through requests from other City of Bellevue staff or to meet particular requirements of various capital projects.
- Both ornamental and native plants are grown in anticipation of annual needs based on history.
- Some plants are grown as test subjects for possible introduction into park landscapes.

4.4 Best Management Practices

The following are standard practices for preparing and maintaining plants grown in City of Bellevue nursery operations.

Site Preparation

- All plant growing areas shall have adequate drainage to ensure plants are not sitting in water or saturated soil. A slow release fertilizer is typically added to the soil prior to planting.
- Field growing soil and imported potting soil shall be tested as needed to determine the need for amendments/nutrients and for the presence of unwanted pathogens..
- The container soil mix shall be compost (20%), peat (15%), pumice (25%) and fine decomposed bark (40%) with 1 lb. calcium nitrate added per cubic yard.
- Soil for field growing shall be a sandy loam with not more than 30% organic material in the form of equal parts of compost and bark (Note: bark in this case is fir or hemlock free of wood waste products. Cedar bark or chipping debris shall not be used).

Site Maintenance

- Noxious weeds shall be controlled or removed from the site during preparation.
- Roads and pathways shall be maintained on an annual basis to ensure accessibility.
- Any exposed soils or bark piles shall be covered with plastic.
- The general public shall not have access to the nursery grounds except and unless a pre-approved department staff person is also present.

Cultural Care

The following are preventive maintenance techniques the City of Bellevue uses to ensure the quality of its nursery grown plants.

- All plants should be spaced to allow for optimal growth, especially in field growing areas.

- Containerized plants shall be re-potted as needed to prevent encircling roots and to allow them to grow into their desired natural form without girdling.
- All plants shall be watered as needed. The primary method of irrigation is the existing overhead system. This system works well for field growing areas but is modified as needed for watering containerized plants.
- City water used for plant irrigation purposes shall be used efficiently.
 - ◊ Plants will be grouped by size and water needs.
 - ◊ Watering will be done on an as-needed basis.
 - ◊ The most efficient system for watering individual planted areas will be used.
 - ◊ Avoid watering nursery areas that are not currently holding plants.
- The nursery shall support recycling.
 - ◊ Clean compost will be used whenever possible.
 - ◊ Growing containers will be reused (following cleaning).
 - ◊ Plant debris will be sent to “clean-green.”
 - ◊ Used soil from containers will be reused onsite whenever possible.
- Plants shall be fertilized as needed using slow-release types of fertilizers.
- Plant holding areas shall be used for plants that are in transition. While in holding, plants shall be mulched, staked as needed, watered, and provided with shade protection if required.
- Winter protection shall be provided for plants as needed through the use of existing greenhouses or “frost blankets.” Smaller, more tender plants shall have priority for winter protection.

Notes:

4.5 Integrated Pest Management

Control of pests in the nursery environment is very important because many plants may be affected.

Pest Tolerance Thresholds

- Pests that threaten the health of the nursery crops will not be tolerated and will be controlled.

Pest Management Strategies

Surface and Groundwater Protection

- General site runoff is controlled through bio-filtration.
- Select the least toxic and most non-leaching chemical products only when necessary. Precisely follow all label instructions.

Weed Control

- Most weed control at the nursery is accomplished through hand weeding, mulching and use of landscape fabrics
- When other controls have failed, herbicide is used for spot control of weeds.

4. Nursery Operations

Notes:

Disease Control

- Select disease-resistant plant varieties and high quality disease free plant material.
- Monitor plant crops for disease outbreaks.
- Practice good cultural practices including watering, fertilizing, pruning and maintaining good air circulation.
- Reduce the potential for transfer of disease through good sanitation techniques. These practices include keeping growing areas, tools and containers clean and removing plant litter and debris in a timely manner.

Insect Controls

- Habitat for natural insect pest predators will be encouraged as an environmentally sound means to reduce populations of insect pests.

4.6 Training

The City of Bellevue will develop a basic training program for staff assigned to work in the nursery. This training will also be made available to other City of Bellevue staff to broaden their horticultural skill base.



Chapter 5 – Plant Beds

Landscape plant beds are often the focal point of a park, streetscape or City building. They provide color, texture, space definition, fragrance, wildlife habitat and other benefits enjoyed by park users. In the Pacific Northwest, climatic conditions favor growing a wide variety of ornamental landscape plants and a rich palette of Northwest native plants. These environmental conditions have allowed planners, designers and maintenance staff to create a landscape plant collection of real beauty. Careful management of these assets is required to continue the heritage and maintain the value of this substantial plant collection. The best management practices described in this chapter are applicable to parks, city buildings and streetscapes that have planting areas as a design function.

Notes:

5.2 Definitions

Biological control – The use of biological agents, such as insects, to control weeds.

Chemical control – The use of herbicides, both pre-and post-emergent.

Disease control – The maintenance of healthy plants accomplished by good cultural practices.

Edging – The control by manual or chemical means of plant growth, both to lawn area surrounding the bed, and plant material in the beds.

Fertilizing – The use of organic or inorganic materials to adjust fertility levels in the soil.

Formal beds – Planting beds that may include ornamentals, annuals and perennials as part of a landscape design

Informal beds – Planting beds that may include native plantings without a formalized landscape design.

Insect control – The suppression or eradication of harmful insects in the landscape.

Irrigation – The supply of water to plantings, either through automatic irrigation systems or manual systems.

Manual or mechanical control – The use of hand and power tools to remove unwanted vegetation.

Plant beds – Plant beds are non-turf, planted areas that include woody plant material such as shrubs and trees and ground covers. Plant beds also include floral color displays containing herbaceous plants such as perennials, annuals and bulbs.

Weed control – The control of undesirable plants species.

Notes:

5.3 Background

Level of visibility and site use dictate maintenance standards for plant beds. Even within the same park, maintenance techniques can differ for formal plantings and high-traffic areas as opposed to remote areas that may remain informal and natural. For that reason, plant bed BMP's are tailored to the specific requirements of plant material and site goals. At a formal site, the desired result may be to promote prolonged bloom in floral displays.

Plant beds can be divided into four categories according to level of visibility and usage:

Floral Beds are very visible and have a high standard of maintenance which includes weekly grooming, weeding and regular site visits.

General Landscape Bed Areas have moderate visibility and standard of maintenance which includes monthly weeding and seasonal pruning.

High-Visibility/Public Facility Landscapes have the highest visibility and the highest standard of maintenance.

Newly-established Landscapes will have a very high standard of maintenance through the plant establishment period (1-5 years).

Existing Site/Environmental Conditions

Site microclimate considerations are taken into account when planning a new planting or renovating an existing one. The following factors must be weighed:

- **Current Landscape Condition.** The condition of current plant material is a good indicator of existing cultural conditions. Compaction, low nutrients, and types of pest populations determine renovation and plant selection options. This is particularly true of soil-borne pathogens such as phytophthora root rot. Selecting resistant plant materials is a must. It is also recommended to select plants that do not require fertilizers or highly specialized care.
- **Soil Type and Condition.** Soil may require amendment to improve drainage or water-holding capacity. Heavy clay or very sandy soils may be improved if desired, but appropriate plant selection is vital to the success of the planting.
- **Drainage.** Irrigation and drainage conditions must be assessed and any improvements included in the design process. Run-off should be eliminated as much as possible. If a site is a steep slope, COB standards must be met. (see *COB Critical Areas Ordinance*)
- **Cultural Conditions.** Cultural conditions such as exposure to sunlight and reflected light and heat, wind, and rainfall apply to plant selection and irrigation installation.
- **Safety.** Safety issues include falling branches, plant growth that blocks pathways, visibility through shrub beds, and rerouting pedestrian traffic to sidewalks.

- **Flowers.** In floral displays, the maintenance budget for the display must be taken into consideration when selecting plant material. Some annuals and perennials require more grooming than time constraints allow and should only be used where they will receive adequate care.
- **Species Diversity.** Species diversity offers a longer season of interest. Monocultures can be more susceptible to total failure in case of insect or disease problems.

Notes:

5.4 Best Management Practices

Site Preparation

Preparing the site is important to the long-term success of a landscape. Making the necessary cultural improvements before planting saves time and money. The following are BMP's for site preparation:

- **Existing Weeds.** To prepare a site for landscaping or renovation, existing weeds and undesirable plant materials should be removed as thoroughly as possible. Weed populations (especially difficult-to-control weeds such as horsetail, morning glory and quack grass) affect planting plans. In a primary bed location, they should be eradicated before installation of new landscapes. If mechanical eradication is not practical, an appropriate chemical control may be used.
- **Overgrown Plants.** Plant material that is too large, or has an expected mature size that is too large for the space, should be replaced with appropriately sized species.
- **Diseased Plants.** Disease and insect-resistant material should be selected and used where the culture will promote healthy growth. In an existing planting to be renovated, diseased plants shall to be removed and replaced with healthy specimens or treated by appropriate means.
- **Soil.** Soil amendments as required should be added to and incorporated into an entire planting area. Avoid tilling saturated soils, which can damage tilth.
- **Water.** Irrigation and drainage systems should be installed as needed.
- **Landscape Features.** Install retaining walls, pathways and hardscape features prior to plant installation to avoid subsequent damage.
- **Rocks and Debris.** Excessive rocks and debris must be removed. Rake area to establish finish grade.
- **Fertilizers.** A soil test indicates fertility levels in the soil. Fertilizer, if required, should be applied to site and incorporated into soil. It helps to know if amendments include uncomposted woody material, which will require nitrogen.
- **Annuals.** Annual flowerbeds shall be spaded or tilled at planting time. Amendments such as compost, sand, or Perlite can be added to adjust drainage. In containers, the addition of hydrating gel can enable the use of plant material that might not otherwise be appropriate because of water requirements.

Notes:

Planting

The following guidelines for proper installation of plant material ensure good establishment and healthy growth.

- **Fertilizer.** If fertilizer is to be used, it is best to wait until plants are established before adding chemical fertilizers to the soil in order to promote long root growth.
- **Depth.** Plants must be placed at proper depth, taking into consideration room needed for mulching and natural setting.
- **Spacing.** Proper spacing with consideration of mature size and spread of plants ensures good establishment. Good air circulation, availability of sunlight, water and nutrients will promote growth and avoid development of disease. Ground covers and floral plantings should be close enough to provide adequate coverage to compete with weeds, and provide effective display, without being too crowded at maturity.
- **Water.** Water new plantings to settle soil and reduce transplant shock. Ensure adequate moisture levels during the growing season.
- **Mulch.** Mulch at planting time for maximum efficiency. Rake soil smooth to prevent puddling, then apply mulch. Avoid smothering small plants. A fine mulch is preferred as it becomes the next season's planting soil.

Edging

Edging controls by either manual or chemical means the plant growth both in the lawn surrounding a bed and plant material in the beds. The main purpose is to maintain a neat edge to the planted area. Proper edging also controls weeds in the bed edge.

- **Informal plantings** can be maintained mechanically or chemically to control turf and weed encroachment onto mulched areas.
- **Formal plantings** can be maintained by hand tools, mechanical means or chemically.

Irrigation

- Site conditions such as soil type and slope, exposure and moisture requirements of plants dictate both frequency and duration of application.
- Weather conditions, such as temperature and rainfall, require monitoring and response. Generally, most plants require at least 1 inch of water per week. Drought tolerant plants, once established, may need less. Floral plantings, particularly in containers, require considerably more.
- Infrequent deep watering is preferable. Avoid creating runoff.
- Shrubs, ground covers and flowers planted in the root zones of large trees need more water to balance the competition from the tree roots.
- Consider pedestrian access, park usage, and available personnel when establishing irrigation schedules.
- Avoid disease damage by keeping water off leaves.
- Be sure to begin watering early enough in the spring to prevent plant stress and hydrophobic soil conditions. Continue irrigating until consistent fall rains begin.
- Visually test and monitor the system weekly.

Mulching

Mulching serves to conserve moisture, retain soil, suppress weed growth, moderate soil temperature, reduce compaction, and supply nutrients for plants and soil microbes. It is also aesthetically pleasing, making it desirable for high visibility locations.

- **Materials.** Materials include bark products, compost, wood chips, and other commercial organic products.
- **Depth of application.** This varies according to type of plant material, but averages 2 to 3 inches. Keep mulch materials away from contact with trunk or crown of plants to avoid stem rot.
- **Edge of beds.** Recess edge of beds to avoid drift of mulch materials onto turf or pavement, where necessary.
- **Flower bed.** Flowerbeds should be mulched with a fine material such as or sifted compost, taking care not to smother plant crowns. Generally, mulch in an annual planting is 1 inch deep although a deeper layer of mulch, if possible, will provide better weed suppression.
- **Woodchips.** Uncomposted woodchips can deplete soil nitrogen as they decompose. Use of woodchips may require application of a nitrogen-rich fertilizer.
- **Fallen leaves.** The use of fallen leaves as mulch may be appropriate in some areas. Avoid using diseased or insect-infested material. It is important to avoid smothering the roots of the desirable plants with too thick a layer. A 2-inch layer is considered best. Compost from plants that are known to be diseased must not be used for mulching purposes.

Fertilizing

Fertilizing, the use of organic or inorganic compounds, shall be tailored to specific requirements for plantings:

- **Nutrients.** Nutrient requirements differ according to plant type and the desired performance of a plant. Turf grass and other plants grown for their vegetative growth require more nitrogen than plants grown for flower and seed production. Plants grown for flower and seeds require more phosphorus and potassium. Too much nitrogen can cause excess growth, which will be more susceptible to insect and disease damage.
- **Application Timing.** Timing application to the biological cycle of the plants is important in maintaining optimum growth. Plants just becoming established may require more P and K in the blend to encourage root development. Also, plants benefit most from fertilizer application at the onset of their new growth in the spring. Applications too close to fall may delay dormancy and promote soft growth, which can suffer winter damage.
- **Micronutrients.** Micronutrients are also important for plant health. It is best to test the soil to determine existing levels of these nutrients because an imbalance can harm plants.
- **Soil pH.** The pH of the soil will determine whether to use an acid or base formulation of fertilizer, as well as the need for lime applications. Always test for pH before applying any fertilizer or lime.

Notes:

Notes:

- **Formula.** Select a formulation that is best for the soil type and time of year. Cold weather slows the activity of soil microbes that make nutrients available to the plants. Plants require nitrogen, phosphorous, potassium and other nutrients to optimize growth.
- **Floral plantings.** Floral plantings can be fertilized at planting time with slow-release fertilizer. Flowers can also be supplemented during growing season with foliar feedings of liquid fertilizer.
- **Compost.** Compost can be applied as a nutrient source. It must be fully decomposed so that nutrients are made available to plants. Most compost has no more than 3% nitrogen, which is slowly released. Its main benefit is that it encourages beneficial soil microbial growth.

Pruning

Pruning shall be performed according to current ISA standards and for the following reasons:

- Encouraging and directing new growth and flowering
- Removing spent blooms and foliage
- Removing insect, disease, and weather damage
- Maintaining size and shape
- Maintaining visibility
- Improving safety
- Creating pedestrian and mower access.

The following are **BMPs** for pruning:

- **Plant Selection.** Use appropriate plant materials that grow to the correct size for the space. Plant selection reduces the need for excessive pruning.
- **Natural Form.** A natural form is desirable in most park settings.
- **Hedge Pruning.** Hedge pruning requires careful timing for optimum results:
 - ◇ First cut should be made as new growth begins to harden off
 - ◇ Last hedging should be made no later than mid-August
 - ◇ Hedges should be wider at bottom than top
 - ◇ Hedge pruning is labor-intensive and is best applied to plants with smaller leaves as they tolerate heavy pruning better.
 - ◇ Because the intensity of maintenance required, formally-pruned hedges are not desirable in many park locations.
 - ◇ When major pruning is required of prominent plantings and hedges, neighbors/park users may need to be notified in advance of the work to be done.
- **Timing.** The best timing of pruning for most plant material is following flowering. Workload balancing, however, often dictates dormant season pruning.
- **Growth Habit.** Growth habit of specific plant material will determine optimum pruning method.

5.5 Integrated Pest Management

Plant beds are defined as non-turf planted areas that include woody plant material such as shrubs and trees and ground covers. The category also includes floral color displays containing herbaceous plants such as perennials, annuals, and bulbs. The most serious pest management issue in plant beds is weed control. If not controlled, weeds not only make a plant look unkempt but, more importantly, can out-compete desirable landscape plants resulting in a loss of assets. Table 1 shows pest tolerance thresholds and IPM principles that shall be employed in selecting maintenance methods for plant beds.

Table 1. Pest Tolerance Thresholds for Plant Bed.

| Area | Weeds | Insects | Disease |
|--|---|--|---|
| General Landscape Beds | Some weeds acceptable. Goal is for bed areas to be generally free of weeds for both asset protection and appearance. Weeds will not be allowed to out-compete desirable landscape plants. | Generally tolerated unless particularly valuable plants are actually threatened. | Occasionally tolerated. Manual and cultural controls preferred. Chemical controls used to save specimens. |
| Highly-visible/ Public facility landscapes/ Bellevue Botanical Gardens | Generally not acceptable. | Generally tolerated unless they threaten particularly valuable plants. Manual removal of obvious pests is encouraged. | Occasionally tolerated. Manual and cultural controls preferred. Chemical controls used when other means fail. |
| Floral beds | Generally not acceptable. | Generally tolerated. | Disease problems tolerated. Plants may be replaced when appearance is impacted. |
| Newly-established landscapes | Weed control is very important to ensure complete establishment of desired plants. | Generally tolerated. Presence of pests may result in host plant being removed and replaced. | Disease problems, if minor, will be tolerated. Presence of disease problems may result in host plant removal and replacement. |

5.6 Training

- Training in IPM alternatives for plant bed maintenance will be provided to field staff.
- Staff will receive ongoing training in:
 - basic horticultural care
 - growth standards, plant identification
 - soils
 - chemical application



Chapter 6 – Turf

Turf provides a forgiving and resilient surface for many recreational activities and is the traditional “green carpet” visitors associate with parks. Because turf varies substantially in use, so do turf management practices. Appropriate management ensures high quality turf where it is needed such as on athletic fields and golf courses and that the designed use of a site is met. The best management practices described in this chapter for turf management would also be applicable for city streetscapes with turf as a component of the landscape.

Notes:

6.2 Definitions

Edging – Grass removal along the edges of turf areas.

Mulching – Grass clippings left after mowing, that provide nutrients and organic matter to the soils.

Trimming – Mowing and grass removal in areas that cannot be accessed by large riding mowers.

Turf – Any lawn or grasses grown in a parks streetscapes or public facility. Turf areas vary widely in type of use from highly maintained athletic fields and golf courses to rough mow areas.

6.3 Background

The park system offers visitors a wide variety of turf, including lawns (both formal and informal), athletic fields, golf courses, meadows and other kinds of turf. Each type of turf requires a separate best management practice. The intensity of management ranges from very highly maintained golf course turf to meadow areas that may get mown 1-2 times a year as a fire prevention measure.

Construction Issues

- Turf areas should be constructed with a minimum slope of 2% to promote surface drainage and a maximum of 15% to allow riding mowers to safely access the areas.
- Whenever possible, the existing soil should be amended with sand and 6” of topsoil to provide a drier surface area. Dry areas allow easier and earlier (in the mowing season) maintenance.
- Trees, signposts, benches and other park amenities should be carefully placed in turf areas to reduce the need for hand trimming. If possible, these amenities should have the turf immediately surrounding them removed (such as for a tree ring) to protect the amenity and to facilitate more efficient turf care.
- Whenever possible, seeding should occur during the spring or fall months to insure maximum germination.
- Design a natural buffer area (no pesticide or fertilizer use) between turf and water bodies or drainage systems. If possible, buffer should be 50 feet.

Notes:

Plant Selection

Selection of grass species is based on site conditions, expected usage, and maintenance standards. Sites with optimum growing conditions and high maintenance standards are seeded with blends of several species of perennial rye grass. Sites with poor drainage, partial shade, and limited fertilizer applications require blends of perennial rye grass and red fescues.

6.4 Best Management Practices

The following BMPs apply to all City of Bellevue turf plantings. Some variations may apply to golf course turf.

Mowing

- **Frequency.** The importance of regular mowing to promote healthy turf cannot be over-emphasized. Growth should be monitored and frequency increased to avoid removing more than 1/3 of the leaf blade. The following is the basic standard for mowing frequency:

| Season | Frequency |
|---------------------|----------------------|
| March - October | Weekly |
| February & November | Monthly or as needed |
| December | As needed |

- **Cutting Height.** Mowing height should be 1.5 to 2 inches to promote healthier turf. Lower cutting height often results in scalping spots where the ground is uneven.
- **Mulch Mowing.** Grass clippings should rarely be removed from mowed turf areas. The plant nutrients and organic material they contain play an important role in developing a healthy, productive environment for root growth.
 - ◇ Mowing patterns should be alternated to avoid ruts and compaction from the wheels.
 - ◇ Avoid driving on frozen turf.
 - ◇ Avoid driving on wet ground where ruts will remain. Walk the site during wet conditions to do a visual inspection.
 - ◇ Mowing equipment must be maintained regularly, especially sharpening and adjusting of cutting edges.
 - ◇ Ensure that grass clippings do not have the potential to be washed into stream or drainage systems, which can degrade water quality.

Trimming

- Trimming shall be performed by walk behind mowers and line trimmers in areas that cannot be accessed by riding mowers.
- Trimming should be coordinated to coincide with other mowing activities on the site.

Edging

- Edging shall be performed a minimum of 2 to 4 times per year, depending on the maintenance standard for the site. Turf edging is done to give a finished look to lawn areas that border paved surfaces or planting areas.
- At high visibility locations, edging shall be performed more frequently.
- Edging should be performed with metal bladed equipment, whenever possible, to prevent damaging turf edges.

Irrigation

- Automatic irrigation effectiveness shall be monitored on a weekly basis or more for sand based fields.
- Approximately **1 inch** of water, including rainwater, shall be applied per week. During spring rainy seasons and summer drought months, irrigation techniques should be modified to fit the weather. Theoretically, the irrigation cycle should be extended to the point just before drought stress occurs. This period varies with soil conditions, weather, site usage, and maintenance practices.
- Irrigation should be scheduled to promote deep root growth.

Fertilization

- Fertilizer shall be a slow release compound of Nitrogen (N), Iron (Fe), and Potassium (K), the ratio dependent upon the time of year.
- Fertilized turf shall be pH soil tested on a 3-year cycle.
- Each application should not exceed 1 lb. of N per 1000 square feet.
- Applications during heavy rainfall shall be avoided to prevent runoff.
- Applications in very hot weather shall be avoided.
- Irrigation should be operational before application during the growing season.
- Sprinkler heads should be marked to avoid damaging them during tractor applications.
- Excess fertilizer shall be removed from hard surfaces immediately.
- Micronutrients and lime should be added, as soil tests indicate.
- Site-specific fertilizer restrictions must be observed. Site-specific cautions include restricting use of fertilizer on turf areas adjacent to streams and wetlands and prohibiting phosphorus within 25 ft of lakes and waterways.

Aeration

- Aeration shall be done 2 to 3 times per year using .75-inch hollow or solid tines.
 - ◊ Best periods: March, April, late June, and late August.
 - ◊ Technique: make at least 2 passes at 90-degree angles.
- Areas with drainage problems should be deep-tine aerified 1-2 times per year using 1" by 6" hollow or solid tines.

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Top Dressing

- General-use top-dressing mix shall be used. Top-dressing should be primarily sand with minimum amounts of organic matter.
 - ◊ Frequency: most effective applied lightly and frequently.
 - ◊ Each application should be about 1/4 inch.

Over-seeding

- Heavily impacted areas should be over-seeded at least once per year.
 - ◊ Best practice is to over-seed in fall and slicer-seed in spring.
 - ◊ Over-seed rate is approximately 5 lbs./1000 sq. ft.
- The following site characteristics, usage, and maintenance practices shall guide seed selection:
 - ◊ Ideal sites with full sun, good drainage, and reasonable fertility are suited for perennial ryegrass blends.
 - ◊ Lawns that are in partial shade or poorly drained should be seeded with mixes of perennial rye and fescues.
 - ◊ Remove leaves and debris from turf prior to over-seeding.
 - ◊ Keep leaves and debris off turf, as much as possible, after over-seeding to promote successful germination of grass seed.

Site Standards

Site standards for turf vary by landscape classification. Landscape classifications include; prominent, general, and non-irrigated lawns, steep slopes, meadows, soil and sand-based athletic fields, and bathing beaches.

Prominent Irrigated Lawn Areas

These are high-visibility or high-use landscapes. Some examples are; community center lawns, popular picnic areas, sunbathing areas, lawns adjacent to busy arterials, beach parks, City buildings, community parks, The Bellevue Botanical Garden, and smaller neighborhood parks where the lawn is the most significant amenity. Maintenance of these areas should be comparable to an athletic field with additional emphasis on trimming and edging.

- **Fertilization:** Soil shall be pH tested to determine fertilization requirements. Based on pH test results, 2 applications per year of fertilizer mix shall be applied.
- **Aeration:** should occur 2 to 3 times per year with conventional 0.75-inch hollow tines.
- **Over-seeding:** the entire field at least once per year at 5 lbs. per 1000 sq. ft. Monthly applications should occur in heavy traffic areas.

General Irrigated Lawn Areas

These are lawn areas in parks of various types where irrigation is available.

- **Fertilization:** apply N-K ratio at 1 to 2 lbs. N per year, per 1000 sq. ft., in 1 to 2 applications. Preferable fall N-K ratio is 15-0-31 with 6% iron and spring N-K ratio is 22-0-22 with 6% iron.
- **Aeration:** should occur 1 to 2 times per year with conventional 0.75-inch hollow tines.
- **Over-seed** as needed. Best done April, May, and October.

Non-Irrigated Lawn Areas

These are lawn areas in parks of various types where irrigation is not available.

- **Fertilization:** N-K should be applied once in October/November.
- **Over-seeding:** As needed. Best done in October.

Steep Slopes

Mowing and maintaining turf on steep slopes can be hazardous. Whenever possible, low growing shrubs or ground covers should be planted on steep slopes. This will greatly reduce maintenance needs and increase erosion control. If turf is ever required on a steep slope, the following management practices should be followed:

- Grass growth should be controlled mechanically with string trimmers.
- Turf growth regulators should be sprayed to extend trimming cycle.
- Consider leaving un-mown or mowing only 1 or 2 times per year.
- Consider replacement of existing turf with low growing shrubs or groundcovers.

Meadows

Meadows are unique environments that function primarily as wild-life habitat.

- Mowing should be infrequent with the goal being brush suppression and fire control. Analyze the site for potential fire threat and fire control strategies.
- Successful establishment of native species requires that they have the opportunity to set and release seed before mowing.
- Site access routes should consider maintenance, interpretive value, and habitat preservation.
- Species selection should be matched with existing available groundwater.
- Location of meadows should attempt to link other wildlife areas into larger contiguous habitat areas.
- Scheduling and timing should minimize impacts to wildlife nesting and habitation.
- Mowing once every 2 to 3 years may be sufficient for woody brush control. Firebreak areas may require more frequent mowing to maintain. Mowing heights should be 3 to 5 inches.

Soil-Based Athletic Fields

These athletic fields are generally composed of native soil, formed on-site, with minimal amendment. These facilities are characterized by scheduled play. Drop-in fields are maintained as general irrigated lawns unless there is exceptionally high usage.

- **Soil:** soil shall be pH tested every two years. Add lime, as needed, to ensure optimum nutrient intake.
- **Fertilization:** N-K shall be applied at a ratio at 2 to 6 lb. of N/year in 3 to 4 applications.

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- **Aeration:** should occur 4 times per year with conventional 0.75-inch hollow tines. Field should be deep-tine aerated every 1 to 2 years.
- **Over-seeding:** the entire field at least once per year at 5 lbs./1000 sq. ft. or about 375 lbs. per soccer field. Monthly applications should occur in heavy wear areas, such as the goalmouth, during the playing season.

Sand-Based Athletic Fields

These fields are entirely composed of imported sand and are known for their outstanding drainage capability.

- **Irrigation:** more frequently than on soil fields
- **Fertilization:** apply N-K ratio at 3 to 6 lbs. of N/year in 6 to 8 applications, dependent on turf type and time of year.
- **Aeration:** should occur 2 to 3 times per year with conventional 0.75-inch hollow tines. Deep-tine aerating every 2 to 3 years should also be done.
- **Over-seeding:** the entire field or ball field at least once per year at 5 lbs./1000 sq. ft., or about 375 lbs. per soccer field. Monthly applications should occur in heavy traffic areas such as goalmouths during playing season.

Bathing Beaches

- **Fertilization:** apply 2 to 6 lbs. of N/year in 2 to 3 applications of a slow-release product.
- Special care should be taken to avoid fertilizing in advance of heavy rains or before expected heavy park use periods.
- **Aeration:** should occur 2 to 3 times per year with conventional 0.75-inch hollow tines.
- **Over-seeding:** the entire lawn at least once per year at 5 lbs./1000 sq. ft. Monthly applications should occur in heavy traffic areas.

6.5 Integrated Pest Management

Pest Tolerance Thresholds

- Weed, insect and disease pests are typically tolerated in general park lawn areas.
- Turf pests in highly maintained turf such as; athletic fields, bathing beaches, and other high-visibility/high-use areas are controlled through proper turf cultural practices.
- Pesticides can be applied to park turf areas only when thresholds for weeds, especially in high profile areas, become unacceptable.
- Because of the unique conditions present on golf courses, a variety of pest control measures are used, including mechanical, cultural and chemical.

Pest Management Strategies

Weed Control

As discussed, weeds in turf are generally tolerated with the exception of those in golf course turf and high-visibility park turf areas.

When control is necessary, the primary method is through the following cultural practices:

- careful monitoring of watering practices
- fertilization
- aeration
- top-dressing
- overseeding

By performing preventative maintenance, park turf is healthier and better able to compete with various broadleaf weeds.

Chemical weed control may be used for controlling particularly difficult weeds in high-visibility turf areas.

- In extreme situations, the least toxic, least residual pesticide will be used. Pesticide use should be avoided near water ways.
- General broadcast treatments will be avoided.
- The timing of chemical weed control applications will be made to avoid contact with the public to the extent possible.
- Posting of the site that has been treated will be done to meet or exceed legal requirements.

Maintenance of City golf courses includes treatment of broadleaf weeds through cultural practices and spot applications of carefully selected herbicides.

Woody Brush Control

Woody brush control in meadows may require the use of chemical controls if mechanical control measures are not adequate.

Insect Control

The only insect pest of significance for turf in Bellevue is the European crane fly. While it can be damaging to turf areas, the crane fly is not generally treated by prophylactic control in Bellevue parks.

- Chemical control is used only in the rarest of circumstances on turf of very high visibility and value such as golf course turf and very selected high-visibility /high-use park turf areas.
- Any chemical applications will be spot treatments directed specifically at the turf areas containing the pest.

Disease Control

General Park Turf. Disease in general park turf is generally tolerated and is not actively controlled.

- In high-use/high-visibility park turf areas, disease will be controlled to a considerable degree by sound cultural practices. Pesticides may be used if the disease is not controllable through cultural practices.

Golf Course Turf. Because turf disease can be a problem on golf courses, it must be controlled to preserve the function of this asset. Golf course turf, particularly greens and tees, must perform under extreme conditions of maintenance and use. The

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condition of the turf affects playability and aesthetics of a golf course. These conditions make golf course turf more susceptible to disease than other park turf. IPM practices are used to maintain healthy golf course turf.

- Disease is tolerated on fairways and rough areas, and is not tolerated on greens or tees.
- Certain diseases are controlled through the application of an appropriate fungicide.
- When used, fungicides are applied to the diseased turf only.
- The least toxic yet, still effective, products are used.
- The type of fungicide used will be changed from year to year to reduce the chance of the turf disease developing a resistance to the chemical control.

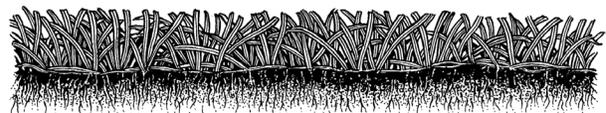
Grass Trimming Abatement

Controlling grass along fence lines, around trees and other landscape features helps preserve the asset by allowing large riding lawn mowers to steer clear of objects. This routine maintenance activity is especially important around trees where mower damage can easily lead to tree loss. An additional advantage of grass trimming abatement is that it makes parks appear clean and well kept. This image, in turn, has a positive impact on how the public uses our facilities. Well-maintained parks experience less vandalism and misuse. Grass trimming is accomplished in the following ways:

- **String trimmers or push mowers.** Grass is trimmed using gas-powered string trimmers or push-type lawn mowers. This practice is very labor intensive, costly, and produces noise and air pollution.
- **Herbicide.** This work is also often performed through the annual (or less frequent) application of the herbicide Roundup Pro. This product is sometimes used in conjunction with Surflan to provide ongoing pre-emergent control of weed and grass seed not yet germinated in tree rings and similar areas.
- **Concrete mow strips.** As resources are available, it is sometimes possible to provide a “mow strip” of concrete or a similar low maintenance product around some landscape features to eliminate the need for grass trimming. This control option is costly and doesn’t work in all situations.

6.6 Training

- All park maintenance field staff should have training in basic turf management.
- The City mower operators have specific training regarding mowing heights and patterns.



Chapter 8 - Trees and Natural Areas

Trees and natural areas provide a multitude of benefits that enhance the quality of our lives. The maintenance and management of these valuable resources is essential for the long term welfare of Bellevue and its citizens. The health of the urban forest is a major indicator of the health of our ecosystem. This chapter identifies and defines the best management practices required to ensure a healthy urban forest.

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8.2 Definitions

Certified Arborist – An individual who has demonstrated knowledge and competency through obtainment of the current International Society of Arboriculture arborist certification, or who is a member of the American Society of Consulting Arborists.

Dead Tree – A tree that is dead or that has been damaged beyond repair or is in an advanced state of decline (where an insufficient amount of live tissue, green leaves, limbs or branches, exists to sustain life) and has been determined to be such by a *certified arborist*. If the tree has been determined to be dead, *removal* is permitted.

Diameter at Breast Height (DBH) – The diameter of the tree trunk at four and one-half feet (or 54 inches) above natural grade level. The diameter may be calculated by using the following formula: $DBH = \text{circumference at 4.5-feet} \times 3.14$. To determine the DBH of multi-trunk trees or measuring trees on slopes, consult the current *Guide for Plant Appraisal*, published by the Council of Tree and Landscape Appraisers.

Hazardous Tree – A tree that possesses a structural defect which poses an imminent risk if the tree, or part of the tree, could fall on someone or something of value (target).

Monitor tree – A tree that because of its value warrants further monitoring to determine an appropriate management strategy.

Sensitive area – An area mapped or defined in the City of Bellevue Sensitive Area Notebook as a Sensitive Area including Areas of Special Flood Hazard, Wetlands, Riparian Corridors and Slopes equal to or exceeding 15 percent.

Significant tree – A healthy evergreen, eight inches in diameter or greater, measured four feet above existing grade and a healthy deciduous tree, 12 inches in diameter or greater, measured four feet above existing grade. (BCC 23.76)

Snag – Any standing dead tree.

Soil Fracturing – The loosening of hard or compacted soil around a tree by means of a pneumatic soil probe (Air Spade) that delivers sudden bursts of air to crack, loosen or expand the soil to improve the root growing environment.

8. Trees and Natural Areas

Notes:

Street Tree – Any tree or large shrub growing within the public right-of-way. In some cases, property lines lie several feet behind the sidewalks. A Right-of-Way Use Permit from the City of Bellevue Transportation Department is required prior to any work on or around these trees.

Target – a term used to include people, vehicles, structures or something subject to damage by a tree. Note: A tree cannot be a hazard if a target is absent within the falling distance of a tree or its parts. A defective tree in a non-populated area away from pathways may not be considered a hazard.

Topping - The reduction of a tree's size using heading cuts that shorten limbs or branches back to a predetermined crown limit. Topping is not an acceptable practice. (ANSI A300 - 2001)

Tree Appraisal – A method of determining the monetary value of a tree as it relates to the real estate value of the property, neighborhood or community. When required, a *certified arborist* or forester determines the appraisal by adjusting a tree's basic value by its condition, location and species using the most recent edition of the *Guide for Plant Appraisal*, published by the Council of Tree and Landscape Appraisers.

Trenching – Any excavation to provide irrigation, install foundations, utility lines, services, pipe, drainage or other property improvements below grade.

Vertical Mulching – Auguring, hydraulic or air excavation of vertical holes within a tree's root zone to loosen and aerate the soil, typically to mitigate compacted soil. Holes are typically penetrated 4- to 6-feet on center, 2- to 3-feet deep, 2- to 6-inches in diameter and backfilled with either Perlite, vermiculite, peat moss or a mixture thereof.

8.3 Background

The Bellevue park system manages nearly 2,500 acres which includes over 7000 street-trees, and thousands of trees that cover the rest of the parks and natural areas. Trees and forests are long-term investments to the urban society that must be managed with the same skill and diligence as any city asset.

Public trees and forests in Bellevue can be classified into three categories:

1. **Street trees:** which are part of improvements made within the City of Bellevue Right-of-Way through either Capital Improvement Program projects or private development. These trees require the greatest level of maintenance and have the highest level of tree/people interaction. Because of the constrained and difficult growing conditions, these trees are most likely to suffer from mechanical damage, biotic and abiotic disorders and vandalism. The management of the street tree population directly affects the adjacent property owners and the character of the community.
2. **Formal park areas:** These trees require frequent maintenance and have a high likelihood of tree/people interaction. These trees also have a potential for mechanical injury and demand a high level of care and consideration during design and construction activities.

3. **Periphery of formal park areas/natural areas:** These trees require the least amount of maintenance because of their often remote and sheltered locations. The trees in these areas are managed not as individual trees, but rather as stands of trees linked to the associated plants and sites on which they reside. These trees can come in conflict with people when they occur along property lines, adjacent to man-made structures or near gathering places.

Notes:

Design

Selection

Selecting trees that adapt well to their site and fulfill their landscape function is extremely important to the success and maintenance of a planting. The quality of young plants is also crucial. A plant species should be selected on the basis of its functional uses, its adaptation to the site, and the amount of care it will require.

Landscape Functions

There are four main functions to consider when selecting trees to include in the landscape design.

- Architectural features: privacy, view enhancement, and space articulation
- Engineering: reduce glare, direct traffic, filter air, reduce soil erosion, and attenuate noise
- Climatic influences: transpirational cooling; interception of solar radiation, reflection, and re-radiation; and modification of rain, fog and snow deposition
- Aesthetic uses: form, color, and texture.

Site Adaptation

It is important to plant the right tree in the right place. The intended landscape use and nature of a site should be considered when selecting for growth habit and ultimate size. Mature size is an important consideration. The tree should not outgrow its allotted space given such constraints as vistas and power-lines. The following table may be used as a guide in selecting the right tree:

8. Trees and Natural Areas

| Tree Selection Factors | |
|--|---|
| Feature | Benefit |
| Rate of Growth | Fast-growing trees tolerate difficult sites, are usually weak-wooded and subject to limb breakage; and generally are shorter lived. The opposite is generally true for slow-growing trees. |
| Wood Strength | When a tree decays or weakens, it can become a hazard to the surrounding area. Strength is based on the trees ability to withstand wind loads, snow bearing loads, water saturation or drought, and its adaptability to its surroundings. |
| Rooting | Roots are what keeps the tree anchored in the ground. Through them pass nutrients and water that nourish and support the tree. Stressors such as: drought, flooding, disturbance, disease, or damage can greatly affect tree roots and the health of the tree. |
| Plant Features | <ul style="list-style-type: none"> • Leaves: Color, size, persistence • Thorns and prickly foliage: Enhanced security vs. maintenance problems • Flowers and fruit: Aesthetic consideration, wildlife habitat. Potentially increased maintenance. |
| Climatic Adaptation | <ul style="list-style-type: none"> • Plant hardiness and local minimum temperatures • Moisture – natural or irrigated • Light – reflect or allow for winter heating • Wind – deflect or channel wind patterns |
| Soils | Poor soils can cause failure of planting. Amendment not desirable or feasible. Match plant to soil condition. |
| Air pollution | Choose trees with appropriate tolerance level. |
| Pest Resistance | Resistant plant material will reduce maintenance. |
| Native Plants | Native or indigenous plants may not perform as well as exotic or non-native species. Most urban landscape sites are no longer “native.” Soils, microclimates and water regimes have changed. |
| Selecting Quality Stock | Selection of quality planting stock is as important to success as selection of proper species, planting and maintenance. Root and shoot quality can determine not only performance but also survival. |
| Root defects | Kink roots, girdling (circling roots) can eventually “choke” a tree. |
| Top & Trunk Characteristics | <ul style="list-style-type: none"> • Height-to-Caliper ratio (see ANSI Z60.1 specs.) • Crown configuration • Branching pattern |

(Source: Seattle Parks & Recreation)

8.4 Best Management Practices

The management and maintenance of trees by the City of Bellevue Parks & Community Services Department consists of a number of practices. The practices are covered in the following section and include: planting, pruning, removal, inventory and routine inspections, irrigation, fertilization and pest management. Activities associated with the protection and management of trees and vegetation before and during construction are covered in the Construction Site Management chapter.

Notes:

Street and Park Tree Planting

- All plant material shall be nursery grown under climate conditions similar to or harder than at the site and meet or exceed The American Standards for Nursery Stock (ANSI Z60.1-1996).
- Ideal planting hole should be 2 to 5 times the diameter of the root spread or root ball.
- Minimum planting hole shall be 12 inches wider in diameter than root spread or root ball.
- The hole shall be no deeper than the ball and the ball shall sit firmly on undisturbed subsoil.
- Native soil shall be used to backfill the planting hole except in situations where the existing soil is contaminated or filled with rubble or pure clay.
- Balled-and-burlapped (B&B) trees shall be placed in the hole and plumbed vertically. All rope shall be removed from around the trunk of the tree and the top 1/2 of the burlap shall be folded back down into the hole. Whenever possible, remove the top 1/2 of burlap by cutting it away with a sharp knife. Trees in wire baskets shall have the top 1/2 of the basket removed, using bolt cutters, to expose the top 18 inches of the ball.
- B&B packaging material shall not be removed until the tree is placed in the hole and securely plumbed into its final position. No false balls shall be used.
- Soil should be backfilled in lifts of 4 to 6 inches at a time with compaction of each layer. Do not compact saturated soil. Water thoroughly after backfilling to settle the soil, eliminate air pockets and re-wet the root system.
- Trees planted in sandy or loamy soils should have a 3-inch-high berm erected just past the perimeter of the planting hole to funnel water to the root ball and wet the hole or sidewall interface. Berms should not be constructed in clay soils or on heavily compacted sites.
- All trees shall be mulched with 3 to 4 inches of shredded mulch or composted brush chips immediately after backfilling. Maintain 3 to 4 inches of mulch annually.
- Mulch shall extend past the diameter of the tree planting pit at least 6 inches.
- Mulch shall be kept away from the tree trunk. Mulch shall taper from the 3-inch depth back to grade right at the trunk to avoid decay of bark tissues.

8. Trees and Natural Areas

Notes:

- Newly planted trees shall be watered weekly through the first three growing seasons.
- Trees shall receive approximately 1 inch of water per week including rainfall.
- Weeds should be suppressed within the mulch ring to eliminate competition and for aesthetics in formal parks and along streets.
- Weeds and/or turf shall not be allowed to grow up to the tree trunk at any time. This increases the likelihood of mechanical trunk injury.
- Ideal months for planting are October through April, as long as the ground is unfrozen.
- Stake only in situations where normal planting procedures do not provide a stable plant. Otherwise, staking is generally not required.
- Stakes and ties shall be removed at the end of the first year.
- Root flare shall be at, or slightly above, grade to allow for slight settling.
- Tree trunks shall not be wrapped.
- Tree trunk wrapping materials, tags, and all ties shall be removed at time of planting.

Natural Area Planting

- All plant material shall be nursery grown under climate conditions similar to or hardier than at the site and meet or exceed The American Standards for Nursery Stock (ANSI Z60.1-1996)
- A 5-by-5-foot area should be free of competing vegetation for 3 years.
- Staking of newly planted trees is not generally necessary. If staking is necessary because of size or conditions, trees should be staked according to COB standards as outlined in the Specification Library shown in the Appendix.
- New trees shall be watered bi-weekly during summer drought stress periods for the first two to three establishment seasons.

Container/Bare Root Planting

- All plant material shall be nursery grown under climate conditions similar to or hardier than at the site and meet or exceed The American Standards for Nursery Stock (ANSI Z60.1-1996) Container plants shall have the container removed prior to placement in the planting pit.
- Tease pot-bound roots with hands or tools prior to final placement in planting pit.
- Bare root plants shall be protected from root drying prior to and immediately after planting.
- Cleanly prune exceptionally long roots to create a uniform root mass.
- Plant bareroot stock at the same grade as grown in the nursery.

Tree Removal

Due to the economic, environmental and social benefits of trees, their removal must well thought out and documented. In general, tree

removal in the City of Bellevue is regulated by BCC 23.76. At times, trees may be removed for new park construction, access or other issues not related to tree viability.

1. Hazard Trees

- Tree hazard assessments shall be performed by qualified personnel to the standards established by the International Society of Arboriculture.
- Hazard trees that cannot be made safe or functional by appropriate mitigation shall be candidates for removal.
- Hazard rating shall be the first determining factor in removal decisions.

2. Tree Removal Permitting

A clear and grade permit is required to remove one or more trees if the total canopy area covers 1000 square feet or greater on the ground. In sensitive areas, such as: steep slopes, riparian corridors or along shorelines, all tree removals must be permitted through the Planning & Community Development Department. In addition, all tree removals occurring in the public Right-of-Way must be accompanied by a Right-of-Way Use Permit, regardless of the amount of canopy area.

Transplanting

If trees are smaller than 10 to 12 inches in diameter, it is possible to transplant them with an appropriately-sized tree-spade. The cost of transplanting should be weighed against the cost of replacing the tree with a new smaller caliper tree. Establishment of large trees is often less successful than planting a new one. The value of the tree to be transplanted should also be taken into account when deciding on removal or replacement rather than transplanting. Different methods of appraising value are reviewed in the 9th edition of *Guide for Tree Appraisal* produced by the Council of Tree and Landscape Appraisers.

Irrigation

- In general, established trees do not require supplemental irrigation except during periods of extreme drought.
- Valuable specimen trees may be irrigated during periods of extreme drought.
- Turf irrigation around established trees needs to be modified to accommodate the water requirements of the trees.
- Water spray on trunks can lead to decay in some species. See Chapter 3, Irrigation and Water Management, for additional information on irrigation practices.

Pruning

Pruning is sometimes necessary for young street trees. Branches that grow into a right-of-way or too close to power-lines can be very dangerous. Usually, branches that grow below 8 feet above a sidewalk or below 14 feet above a street shall be cut back.

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Dead branches should be pruned to restore vigor to a tree. All pruning shall be performed to current ANSI Z133 standards.

Learning the proper method is important as you can seriously wound or even kill a tree. The best time to prune living branches is late in the dormant season or very early in spring before leaves form. Dead and dying branches can be pruned anytime. Use clean sharp tools and make clean cuts.

Do Not:

- Leave living or dead stubs
- Injure or remove the branch collar
- Paint cuts

Topping is prohibited.

Forest and Natural Area Management

Natural Resource Enhancement Plans

A Natural Resource Enhancement Plan is based on an analysis of the ecosystem and the interrelationships of the different components of natural systems, as well as the human impact on their functions. Natural Resource Enhancement Plans are created based on information gathered about the site both in the field and through available background data. This information is then utilized to reflect the goals of the community, and the City of Bellevue. Identified within an Enhancement Plan are the overall intentions for the property.

A Natural Resource Enhancement Plan for a specific site contains the following elements, with maps to illustrate where possible:

- Property Description and Site History
- Sensitive Area Classifications
- Soils and Topography
- Existing Vegetation
- Liability Trees and Situations
- Wildlife
- Recreation
- Management Prescriptions

Boundary Surveys and Staking

- Upon purchase/transfer of a new property to the City or when a property has not previously been surveyed, a boundary line survey should be conducted so both the City of Bellevue and the adjacent property owners are aware of the location of the property lines.
- Boundary surveys shall be conducted by a professional survey firm or City of Bellevue survey staff.
- Following a boundary survey or property inspection, City boundary stakes shall be installed at all corners and along lines to aid in the future identification of the legally surveyed property lines. When the stakes are installed, care should be taken to

ensure that the stakes are placed accurately on the property line and installed securely. (See appendix for a detail of the boundary stakes)

Site Inventory

- The first task in managing our resources following acquisition and liability mitigation is a thorough inventory of the resource itself. The resources needed to accomplish the site inventory include:

- ◊ Deeds and purchase documents
- ◊ City and county plat maps
- ◊ Registered surveys
- ◊ Topographic maps
- ◊ Aerial photos

Start with an inventory of the ownership. Locate the original closing papers, recorded easements, deeds of trust or any conveyance documents that describe the property. The goal is to discover the boundaries, legal histories, and easement restrictions on the land to be managed. If files on the site are incomplete, the County Property or Records Department may prove helpful. Be sure to provide any parcel numbers, legal descriptions, plat names and even street addresses to assist in the research.

- The next step in a site inventory is to collect site-specific information. Site-specific inventory information will help direct the implementation of operational activities necessary in maximizing open space objectives. The site-specific inventory information shall include:

- ◊ Site history
- ◊ Boundary delineation
- ◊ Site liabilities
- ◊ Vegetation habitat type and successional stage
- ◊ Soils, aspect, topography
- ◊ Fish and Wildlife habitat
- ◊ Recreation opportunities
- ◊ Sensitive areas

All of the site inventory information should be documented and stored for future reference and the development of Natural Resource Enhancement plans.

Routine Site Inspections

All forest and natural areas shall be inspected on an annual basis. There are, however, two levels of inspection detail that the inspector may use, first and second-priority inspections.

The most detailed and comprehensive inspection is referred to as a first-priority inspection. First-priority inspections are conducted on sites scheduled to receive enhancements for the year or sites that are politically or environmentally sensitive.

As the names imply, first-priority inspections occur ahead of second-priority inspections. This is because first-priority inspections

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are meant to identify forest management areas of concerns and enhancement tasks, verify the existence of all boundary markers, discover any trespass issues (encroachments, dumping, or tree cutting), and monitor the progress of past enhancement projects.

A second-priority inspection, although not as time consuming, is still comprehensive and well documented. Second-priority inspections cover the balance of open space properties and consist of a general site reconnaissance. Second-priority inspections are focused on the discovery of potential liability situations and trespass infractions.

While conducting a site inspection, it is important to respect the adjacent property owners' rights and concerns. The inspector is a representative of the City of Bellevue and should be polite, courteous, and professional at all times.

Inspection Procedure:

Pre-inspection planning needs to be done to ensure a safe, productive and successful inspection. Spending a few minutes planning and discussing the inspection will help eliminate wasting time over something forgotten.

- Before leaving the office, get a picture of the site characteristics and location
- Determine whether you need to be carrying out a first or second-priority inspection and get answers to any questions you might have
- Let someone in the office know your work plans and location, preferably your supervisor

Property inspections can be a slow and demanding process. Thick vegetation, steep slopes, unmarked property lines, and bad weather all conspire to make the going challenging.

- Use aerial photos to identify your location by looking for identifiable structures or rooflines
- Walk the property line and document all property markers and hazardous trees
- Look for and document with pictures any encroachments, dumping, vegetation removal and tree cutting. Identify the location on the map
- If homeless camps or other illegal activities are discovered, notify the proper authorities for removal

If there are trails on the property, walk the trails and record their general level of upkeep. This brief walkthrough can help the trails crew address maintenance issues.

Record all of the data that was collected. Insert the inspection forms in the site book and report any issues to the supervisor. Clean and store all tools.

Liability Tree Monitoring

Once a tree is designated as a liability tree it shall become the burden of the staff at hand. Although it may be easier and less complicated to simply remove all liabilities, the conservation of trees is something that must be considered until the tree can either be replaced or the tree becomes too great of a liability and must be removed.

Notes:

Trespass Enforcement

Trespass enforcement consists of remedying any of the following actions on park property: clearing of vegetation, including the topping of trees; dumping of debris; and encroachment by construction or developed structures. In 1993, the Parks & Community Services Department developed a Parks Department Encroachment Policy in response to numerous encroachment issues. In the years that followed, the Parks Department clearly identified many of its property boundaries by installing boundary markers. Inasmuch as the installation of these markers greatly reduces the number of trespass situations that arise, they still occur on a regular basis.

The **Parks Department Encroachment Policy**, although developed specifically for encroachment issues, can be applied to all trespass situations. The three steps the policy outlines for the enforcement of encroachment issues are as follows:

- Voluntary Removal of Encroachment – This would primarily be facilitated by Parks’ staff working directly with the property owner to find a mutually agreeable restoration plan and the implementation of such a plan. The interaction with the property owner is usually a mixture of both on site visits and formal letters.
- Boundary Line Adjustment – This option will only be considered a possibility in a situation where the property owner is able to “exchange” land of equal size, value and condition for the land that is encroached. All costs associated with a Boundary Line Adjustment would be borne by the property owner. For clearing or dumping situations this option would not be considered. City Council has final approval of all Boundary Line Adjustment decisions.
- Legal Action – This option is necessary in the rare case where the property owner refuses to accept the trespass as true or refuses to remedy the situation voluntarily. The City Manager’s approval is required for use of Legal Action for enforcement of a trespass.

Natural Resource Enhancement Implementation

Activities related to the implementation of a Natural Resource Enhancement Plan include but is not limited to the following:

- Debris removal & cleanup
- Hazard tree removal
- Preparation and planting of enhancement sites with native plant species

- Silvicultural prescriptions
- Trail construction or upgrades

Notes:

Sensitive/Critical Areas

Sensitive, or critical, areas are defined as those areas that can be adversely affected by any non-natural process, causing degradation to that area, or its biological processes. The City of Bellevue Land Use Code and The Sensitive Areas Notebook define critical areas as:

- Areas of special flood hazard
- Riparian corridors, excluding Type C and D
- Wetlands, excluding Type C
- Areas of colluvial or landslide deposits on slopes of 15% or more
- Slopes of 40% or more
- Areas potentially affected by abandoned coal mines
- Shorelines and aquatic habitats

Bellevue Parks & Community Services Department recognizes the special importance of these areas, as well as others not defined by the Land Use Code, that fall under its stewardship. These sensitive habitats, and their plant and animal communities, have a direct link with other habitats and waterways, that in turn affect entire ecosystems. The goal of the Parks Dept. is to preserve these areas to the fullest possible extent, for the preservation of these species, and for the good of the community.

There are many regulations regarding working in these areas, and therefore many special permits are required by either the City or the state, to do so. For further information, contact the Planning and Community Development Department or refer to the COB Land Use Code.

1. Riparian Corridors

Riparian corridors are sensitive areas that include an interactive vegetation community integrated with the water course ecosystem. Riparian corridors provide food, shelter, breeding and rearing areas for aquatic and terrestrial animals and birds. They encompass the area that runs along both sides of the water body, ranging from 10 -50 feet wide, depending on the sensitivity classification. Included are wetlands and meadows.

- Improper clearing can have serious effects on the ecosystem, allowing for increased runoff, toxin accumulation, oxygen reduction to surrounding plants and water systems, and overall habitat destruction.
- Native vegetation is usually preserved or planted in order to mitigate any negative effects.

If a corridor is located within a Native Growth Protection area, it must be registered with the City.

2. Shoreline and Bank Stability

When reinforcing or protecting a shoreline, one should consider the least impact necessary to achieve reasonable stability. These practices include, but are not limited to:

- Traditional use of riprap should be used only as a last resort. Softer treatments, such as log placement and bioengineering plantings, are preferred, where feasible.
- Treatments should consider seasonal differences, such as the Chittendon Locks operations, and regular seasonal water level changes.

Notes:

3. Steep Slopes

Steep slopes are defined as any slope over 40%, and are considered sensitive, or critical areas. Except in an area of colluvial or landslide deposit, in which case the minimum slope is 15% or greater. The surface slope, soil layers and ground water layers all can impact how stable a slope is. To minimize impacts to a slope and the surrounding area:

- Removing vegetation from the ground layer should be minimized, and plantings should be stabilized with appropriate bioengineering techniques (e.g. netting, wattling, hydro-mulching, etc.).
- Revegetation should be evaluated so as not to cause more damage or disturbance to soil layers.
- Slide areas, or areas suspected of being slide-prone, should be evaluated by a geotechnical expert before extensive restoration begins.
- Storm-water runoff must be prevented from saturating or loading steep slopes. The appropriate drainage system should be in place and adequately maintained to intercept runoff flows before reaching the slope.

4. Slide Areas

Slide areas, or those suspected of being slide-prone, shall be evaluated by a geotechnical expert before extensive restoration is initiated. Strategies can be developed to help maintain or even improve slope stability. The standard practice of hydro-seeding repaired slide areas is prudent but does not restore stability. To restore stability and prevent further soil erosion, subsurface hydration must be considered, and woody vegetation re-established.

5. Wetlands

Wetlands are those sensitive areas that are a transition between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land or is covered by shallow water. The plants that inhabit a wetland are hydrophytic, and adapted to living in hydric soils, sometimes under water. Wetlands serve an important function in that they act as a natural reservoir for storm runoff, offer flood control, recharge ground waters, and filter off toxins that would otherwise find their way in to the water table. They also provide necessary habitat for various wildlife species, unique to any other habitat type.

Most wetlands found within the Bellevue Parks system are treated as sensitive areas and managed with the goal of maintaining the

Notes:

natural environment with the least amount of impact.

- Only invasive and noxious weeds are controlled through mechanical or cultural methods.
- Approved wetland herbicides are used only when necessary, and never near standing water.
- Only native species are planted within a wetland area, unless the wetland is part of one of the agricultural areas that are preserved within the parks system.
- Trails are kept to a minimum and specifically designed to decrease habitat disturbance.

Meadows

Meadows serve an important role in natural and sensitive areas. They provide necessary wildlife habitat, reduce flooding potentials downstream or in low lying areas, and act as a natural filter as water passes through, supplying needed nutrients to the area. Bellevue Parks & Community Services Department has adopted many restorative and maintenance practices regarding meadows and wetland areas. They include grassland vegetative cover, meadow preservation, meadow restoration, habitat preservation, and fire prevention.

Grassland Vegetative Cover

Healthy vegetative cover is important for erosion control, habitat, and noxious weed control.

- **Exotic Grasses.** Most urban meadow sites are previously disturbed sites resulting in regrowth of primarily exotic grasses. Once established, these exotic species should be accepted as the primary component of the vegetative cover.
- **Native Meadow Plants.** Preservation of native plants should be attempted whenever possible.
- **Wet Meadows.** Many meadow areas in this region remain in a saturated condition for 6 months or more. Avoiding significant maintenance activities during this period is recommended. Preservation and introduction of appropriate native plants into these sites will help ensure a healthy vegetative cover.

Preservation

To preserve a grassland, wet meadow, or perennial meadow in the Pacific Northwest requires an ongoing maintenance program.

- **Disturbance.** Avoid creating holes in the vegetative cover because it will open opportunities for noxious weeds to invade.
- **Meadow Succession.** The natural evolutionary process of forest/meadow succession will eventually colonize meadow areas with shrubs and trees. The management of this process will have a major impact on the character and longevity of the meadow. The desired character of a meadow area should be defined. The meadow should be managed to prevent establishment of exotic trees and shrubs. Depending on the desired character of the meadow, all, some, or none of the native plants attempting to colonize the site can be retained.

- **Exotic Weed and Brush Control.** Scotch broom and other noxious weeds colonize many meadow areas, especially if the vegetative cover is weak or not intact. If invasive brush is a minor problem, hand grubbing, use of weed wrenches, or spot spraying with a broadleaf herbicide are options. When invasive brush is a major problem, it may be necessary to mow the meadow on an annual basis. Mowing should be timed to avoid disturbing wildlife. Spring should be avoided to allow protection for ground nesting birds. The site should be monitored for other wildlife activity before mowing occurs. Mowing should also be done before seed set of the targeted species. Mowing heights should be a minimum of 6 inches high to prevent excessive grass clippings and to minimize exposing bare ground.

Notes:

Restoration and Construction of Meadows

Restoration or new construction of a meadow should consider the following:

- **Hydrologic Study of the Site.** Available moisture is the determining factor in appropriate plant selection.
- **Soil Study.** Many native plants require specific soil requirements to succeed.
- **Existing Vegetation.** The site should be assessed for desirable species as well as undesirable species. A small test plot can also help determine the potential weed seed bank in the soil profile. A thorough inventory of existing species can provide valuable information for selection of appropriate species.
- **Natural Succession.** Whenever possible, attempt to emulate the natural succession process by initially introducing primarily pioneering plant species and gradually expanding into later successional species as cultural conditions allow.

Wildlife Habitat

The management practices of meadow areas should reflect the goal of preserving and enhancing desirable wildlife species.

- **Maintenance Activities.** Maintenance activities should be evaluated as to their impact on wildlife and appropriate decisions made.
- **Enhancements.** Many desirable species can be attracted by enhancements such as nesting boxes, brush piles, rock piles, stumps, snags, and specific plants.
- **Environmental Education/Interpretation.** When resources are available, it is important to address environmental education. Educated park users are much more likely to preserve and protect a site.

Organic Debris

Organic debris from maintenance practices will remain on site, as long as it does not interfere with other landscape functions. Types of interference include blocking trails, forming unstable cornices, diverting drainages, and smothering desirable vegetation. Wherever possible, use the following practices:

8. Trees and Natural Areas

Notes:

- Organic debris should be cut and dispersed to maximize ground contact.
- Chipping woody debris is useful as long as debris is left in a depth of 3-inches or less.
- Leave uncut branches and logs in place to restrict traffic into natural areas.
- Stabilize logs to prevent sliding or rolling.
- Remove invasive species from the site.

Fire Prevention

A healthy, diverse plant community is fire resistant, but woody plant debris must be managed in any urban landscape. The following practices encourage fire prevention in natural and sensitive areas:

- Excessive accumulations of dead, woody plant debris should be avoided. Thinly scatter this debris away from park use areas.
- If tree pruning or removal debris remains in a native woodland site, the material should be diced well enough to directly contact the ground.
- Maintain transitions to developed landscapes to provide interruptions to the normal path that fires usually travel. This practice creates a more defensible landscape.
- Hydrants should be located along the edge of natural areas to provide immediate access for firefighting.
- Service roads into large woodland tracts should be maintained to allow access to Fire Department tanker trucks.
- Large woodland tracts with high fire potential should be studied for possible development of service roads.
- Areas of known homeless encampments should be frequently inspected and cleaned up to minimize the potential for wild-fires.

8.5 Integrated Pest Management

Pest Tolerance Thresholds for Trees

- In general, insect and disease pests in trees are tolerated.
- Insect or disease pests in selected, high-value specimen trees may be subject to control measures.

Pest Management Strategies for Trees

Insect Control

Bellevue Parks does not actively control insect pests in trees, particularly tall trees that might require use of large aerial spray equipment. Such equipment carries with it a high probability of insecticide drift.

The following measures are used when insect pests are controlled in trees:

- Trees that are highly susceptible to specific insect pests (such as blue spruce and spruce aphids) may be removed from the landscape and replaced with resistant species.

- When possible, the portion of the tree affected by the insect (such as tent caterpillars) can be physically removed, eliminating the pest.
- An insecticide may be applied to control a specific insect pest in very selected situations. These scenarios include pests on specimen quality trees at special gardens or in high-visibility locations where the presence of the pest threatens the life of the tree. In these situations, general foliar applications will not be made unless the potential for product drift can be controlled.
- New injection technology may allow for systemic control of certain insect pests with minimal or no impact to human or environmental health.

Notes:

Disease Control

Increased concern for the Pacific Madrone and concern about Dutch Elm disease has required Bellevue Parks to become more proactive in managing disease pests in significant trees populations. As with insecticides, it is unlikely that the department will subscribe to general foliar applications of fungicides or similar pesticide products to control disease pests in trees. The following are IPM control measures that can be performed:

- Trees susceptible to particular disease pathogens may be removed from the landscape and replaced with resistant varieties.
- When possible, parts of trees affected by disease should be pruned out and properly disposed to stop the spread of disease within the tree and to adjacent trees.
- An appropriate fungicide may be applied to control a specific disease pathogen in very selected situations. These cases include specimen quality trees in special gardens or in high-visibility park locations where the presence of the disease threatens the life of the tree. In these situations, general foliar applications will not be made unless the potential for product drift can be controlled.
- New injection technology may allow systemic control of certain diseases in tree pests with minimal or no impact to human or environmental health. Bellevue Parks will continue to explore this technology as a potential control for disease pests that may threaten valuable trees.

Physical Damage Prevention

Physical damage to trees can be a major factor in overall tree loss. Damage can occur in many ways. Repeated glancing from mowing equipment, vehicle collisions, vandalism, and improper care during construction projects are all incidents that can kill trees and cost hundreds of dollars. The following best management practices can help reduce physical damage to trees:

- Removing turf from the tree base to create tree rings 3 to 4 feet in diameter can substantially reduce damage caused by mowers and trimmers. With tree rings, a mower or trimmer

Notes:

never has to come close enough to the tree to cause damage. The tree ring shall be kept free of grass and weeds.

- Following the Site Design and Construction Management BMPs substantially reduces, or eliminates, damage from construction activities.
- Damage from vehicles and human vandalism cannot be controlled. Parks shall collect compensation from these incidents. (see Parks code)

Pest Tolerance Thresholds for Natural and Sensitive Areas

- Weeds are generally found in these environments and many will be tolerated.
- Noxious weeds will not be tolerated and will be controlled.
- Invasive plants are generally not tolerated. Invasive plants will be controlled in conjunction with ecosystem restoration efforts in these environments.
- Only insect pests that pose a risk to the public (such as hornets) or to the resource (such as gypsy moth) will be controlled.
- Plant diseases will generally be tolerated unless a specific control can be employed that will be effective in ensuring the health of particularly valuable assets.

Pest Management Strategies for Natural Areas

Weed Control

An overriding principle of IPM is the maintenance of healthy plant communities. That means weed control of the following types:

- **Timed mowing.** Carefully timed mowing before seed set can effectively reduce weed seed sources. Frequent mowing can eliminate blackberry and other woody species.
- **Mulching.** Mulching around the base of plantings is widely accepted as a horticultural practice for soil fertility and weed control. In most instances, composted wood chips or onsite recycled leaf litter are adequate materials. Avoid wood chips from diseased trees. Mulch should be between 2 to 3 inches deep for best results. Care must be given not to incorporate new weed problems with the import and use of lower grade mulch materials, or to allow mulch to runoff into wetland, streams or other water bodies.

Woody Brush Control

- The control of woody brush like blackberries and English ivy is very important in certain park locations. Often these plants are found in transition areas between developed park areas and natural areas. If not controlled, woody brush can easily overtake forest-edge environments, eliminating vital habitat opportunities. Control measures for woody brush include the following:
- Manual or mechanical removal using hand tools or gas-powered equipment.
- Chemical control can be employed when other measures are

not possible or have failed. Spot applications are preferred whenever possible, although area applications may be employed. Any area applications will be limited to the area of infestation.

Stump Re-Sprouting Control

Often there is a need to remove small trees and prevent re-sprouting of a stump. Methods for controlling the re-sprouting of stumps include the following:

- If the location of the stump will allow access by equipment, and the stump is not within an environmentally critical area, then it can be mechanically removed.
- Small stumps may be removed manually if they are not on steep slopes or in other environmentally critical areas.
- The re-sprouting of stumps can also be controlled by painting newly cut stump surfaces with specific herbicides. Care will be taken to limit the application of the selected herbicide to the stump surface only.

Noxious Weed Control

Invasive plants have taken over many of the City's natural areas, radically changing pre-existing ecosystems. Attaining long-term control of invasive plants is essential to recovery and preservation of the City's natural ecosystems. Invasive plant control shall follow the guidelines established by the *King County Noxious Weed Board*. Except in the case of Class A weeds, the goal is suppression of weed populations to below threshold (damage causing) levels. Eradication of certain ecological weeds (blackberry or ivy) in all of the City's natural areas is neither feasible nor cost-effective. However, controlling spread of the problem and eradication in certain priority locations are Bellevue Parks goals. Control methods include:

- Use *extent of removal* and *type of habitat* to determine the pest control method.
- Large areas that are totally infested can be mowed. Areas that are interspersed with invasive pests require more selective procedures such as manual removal.
- Heavy equipment or manual removal can be used on firm soils, but on either steep or saturated soil, use techniques that will minimize site and slope disturbance.
- Where mechanical or manual removal is neither possible nor practical but control is essential, careful and selective use of an approved herbicide is permitted. The list of approved herbicides is limited to Roundup Pro, Rodeo or Garlon 3A. The use of these products shall conform to those BMPs described below in "Herbicide Use."
- Re-establishing a new native planting regime as quickly as possible following the removal of invasive plants is critical to successful forest restoration. These new plantings will require care for several years to guarantee establishment.

Notes:

8. Trees and Natural Areas

- Preserve established native plants, when possible, rather than re-establishing new plants after the clearing of invasives.

Notes:

Insect Control

Insects like the European and Asian gypsy moth and the Asian long-horned beetle can potentially devastate Bellevue's urban forest. Bellevue Parks Department will cooperate with state and federal agencies in their monitoring and control programs to prevent the introduction of these pests.

Generally, insect pests are tolerated in sensitive and natural areas. Only trees in this area that pose a definite risk to the general public will be treated or removed. (See Insect section below)

Disease Control

Disease pathogens that infect trees in sensitive and natural areas, are generally tolerated. Spread is monitored and only in cases where public safety is threatened will any treatment be used.

Nuisance Wildlife

Mountain beavers, beavers, opossums, raccoons, waterfowl and other species can be destructive to natural areas when their activities are excessive. If control of wildlife is needed, Bellevue Parks will work with the most appropriated County (Animal Control) or State (Department of Wildlife) agency to gain control.

Root Rots

Even native forests can have serious disease problems. Root rots are the most serious, often killing significant trees. Several strategies help control root rot in forests:

- inoculate with mycorrhizae
- remove infected wood
- plant resistant varieties
- treat hemlock stumps with borax
- do not change site conditions of mature trees

Herbicide Use

The use of herbicides in any natural environment can have a serious impact on the surrounding ecosystem, and therefore, must be carefully considered. Herbicides will be used for weed control in natural areas only when other control measures have been tried and have failed, or, when past practice strongly indicates that control of the weed pest can only be achieved through the use of a herbicide. The following are Bellevue Parks herbicide use practices:

- Cut and stem treatment (daubing or painting) is the preferred choice for natural area management.
- Certain invasive plants are difficult to treat and control in their mature form. If possible, remove existing growth manually or mechanically. Wait for new growth to emerge, then treat with the appropriate and approved herbicide.
- Only herbicides approved for use in natural areas shall be used.

Notes:

8.6 Training

- Provide training to all construction personnel to make sure they understand all construction site BMPs, including streambed and bank protection, steep slopes and wetland protection.
- The site manager and other designated site managers shall receive the most recent training and education dealing with construction site management. This training includes the most recent advances for protecting trees on construction sites.
- Urban Forestry and site managers should receive training in tree and plant appraisals according to International Society for Arboriculture standards.
- Tree workers will know and understand accepted ISA standards.
- All contracted or volunteer planting crews shall be trained in proper planting techniques by the site manager.



Chapter 9 Trails

Trails play an integral role within the park and open space system. Trails are the most widely used recreational facility managed by the Parks and Community Services Department. They are used and supported by nearly 90% of Bellevue citizens. Trails provide non-motorized and recreational opportunities for walkers, bicyclists, joggers, hikers and birdwatchers. They are the string that physically connects parklands, neighborhoods, schools, and businesses. Trails also provide staff access for maintenance and management of the parks and open space system. Bellevue's trails are designed and constructed in an environmentally sensitive manner to reduce soil compaction, erosion, and runoff to protect sensitive areas from degradation.

Notes:

9.2 Definitions

Compaction – an increase in the density of something, through the act of crushing or compressing.

Geotextile fabric – a synthetic woven fabric used to reinforce and support surface materials, and enhance drainage.

Grade – the degree of inclination of a surface, measured from ground/base level.

Trail – refers to a marked or beaten path, going through or connecting destinations.

9.3 Background

There are over 60 miles of trails within the Bellevue Parks System. Approximately one-half of these trails are interior trails comprised of either bark or gravel, while the remaining trails are external asphalt and gravel connector trails. These paved trails connect parks, neighborhoods, schools and business districts. Trails are developed based on site assessments that consider natural features, aesthetics, and their linkage possibilities.

Site Design Considerations in Wetlands

Design and implementation of trails in a wetland environment requires consideration of certain risks associated with this type of sensitive area. These risks include:

- water-quality impacts
- sedimentation
- introduction of toxins
- increase in nutrient load
- changes in pH, salinity, and oxygen balance
- increases in suspended and dissolved solids and turbidity
- impediment of movement of storm waters (including soil compaction)
- habitat impacts
- fish and wildlife disturbances

Notes:

- aesthetic impacts
- illicit access off developed trails (social trails)

In order to minimize these and other impacts from trails in a wetland:

- When possible, higher ground shall be chosen for trail location.
- Stream crossings shall be avoided, but if necessary, shall be done at 90 degree angles.
- Culverts or bridges shall be installed so the existing drainage will not be altered, and passage for fish and river debris will not be affected.
- Culvert size is dependent upon site conditions, but shall ensure continued stream flow.
- Streambanks and other sensitive areas, will be minimally impacted.
- Geotextile fabric will be used in construction to increase the bearing strength of the trail, minimize fill requirements, disturbance, and maintenance costs.
- To ensure adequate drainage, minimize surface-water velocities, and discourage rutting and erosion, trails shall be graded with slopes of 6% or less, with a 2% or less slope across the trail.

Site Design Considerations in Upland Park Sites

- Consideration shall be given regarding drainage, slope, width, clearing limits, and surface materials for each individual park.
- If narrow corridors are present, stairs and boardwalks shall be considered.
- Steep slopes and wet areas shall be avoided, if possible, for trail development. If necessary, stairs and/or boardwalks shall be utilized to decrease surface impact.
- Trail width shall be 4 feet.
- Trails should follow slope contours to decrease disturbance as much as possible. Trails will be designed to avoid stair installation whenever possible.
- Trail slope shall be based on site conditions and decided upon by site managers. The National Scenic Trails standards may be used to define slope range. Pedestrian use trails normally range from 0-6% slope, with a maximum of 20%. Stairs will be installed on trails with 6-20% slopes.

9.4 Best Management Practices

- Appropriate temporary erosion control techniques will be implemented per City of Bellevue standards.
- Appropriate permits will be filed as necessary for all trail construction.

Bark Trails

- Prior to surfacing, trail shall be manually grubbed out, taking care not to disturb surrounding vegetation. Any areas adjacent to trails where vegetation was removed or damaged, shall be replanted with native species.
- Herbicides shall only be used to maintain trail edges. Herbicides shall not be used on wetland sites.

- Surface drainage techniques shall be utilized, such as:
 - ◊ crowning
 - ◊ in-sloping and out-sloping at 2% grade
 - ◊ culvert installation
 - ◊ slope exposed gutters
 - ◊ Turn pike / French drain systems
- Trails shall maintain a 2 foot minimum horizontal clearance to any obstruction.
- Trails shall maintain a 7 foot minimum vertical clearance from trail surface across the horizontal clearance width.
- Side-slopes shall be graded no greater than a 3:1 slope, and covered with jute fabric and stapled. Grading shall be done so that run-off does not collect at bottom of slope. A 2 ft. wide transition edge is required prior to start of side-slope. Where required, toe of slope exposed gutters are used to route trail water runoff to culverts.
- In wetland sites and sites that have a soft base, Geotextile fabric shall be laid between sub-grade and base course, prior to surfacing.
- Sub-grade shall consist of undisturbed native soil. Sub-grade shall never be compacted.
- Surface shall be grubbed to level trail grade to 2%, to ensure trail drainage.
- Trail surfacing shall consist of medium fine bark applied to a depth of 4 inches, and raked out smooth.
- If necessary, area adjacent to trail shall be re-planted, or landscaped with native shrub / tree / groundcover species.
- Trailheads will have developed signage, a native shrub / tree pallette, and if necessary, a post and rail fence.

Notes:

Crushed Rock/Gravel Trails

- Prior to surfacing, trail shall be manually grubbed out, taking care not to disturb surrounding vegetation. Any areas adjacent to trail where vegetation was removed or damaged, shall be re-planted with native species.
- Herbicides shall only be used to maintain trail edges. Herbicides shall not be used on wetland sites.
- Surface drainage techniques shall be utilized, such as:
 - ◊ crowning
 - ◊ in-sloping and out-sloping at a 2% grade
 - ◊ culvert installation
 - ◊ slope exposed gutters
 - ◊ Turn pike / French drain systems
- Trails shall maintain a 2 foot minimum horizontal clearance to any obstruction.
- Trails shall maintain a 7 foot minimum vertical clearance from trail surface, across the horizontal clearance width.
- Side-slope shall be graded to a 3:1 slope, when possible. Grading shall be done so that accumulation of run-off does not collect at bottom of slope.
- Geotextile fabric is not usually used in park rock / gravel trails.

Notes:

- Sub-grade shall be 5/8 inch crushed rock, compacted to 95% density. Disturbed native soil subgrade should be compacted to 95% density.
- Surfacing base shall be 4 inches of 5/8 minus crushed rock. Trail surface shall be 2 inches of compacted 3/8 minus crushed rock.
- If necessary, area adjacent to trail shall be re-planted, or landscaped with native tree/shrub/groundcover species.
- Trailheads will have developed signage, and if necessary, post and rail fence detail, and a native shrub/tree palette. (see notes in Bark Trails)

Asphalt Trails

- Prior to surfacing, trail shall be grubbed out by mechanical or manual means. Any areas adjacent to trail where vegetation was removed or damaged, shall be replanted with native species.
- All hazard tree and tree limbs shall be removed from trail site.
- Subgrade shall consist of undisturbed native soil. If soil is disturbed, soil shall be compacted to 95% density.
- Geotextile fabric shall be laid between sub-grade and base course.
- Root barrier, if necessary, shall be installed prior to installation of asphalt. Root pruning, when necessary, shall be done by a certified arborist.
- Side-slope shall be graded to a 3:1 slope, when possible. Bottom of side-slope shall be graded to prevent accumulation of run-off.
- Trail surface slope shall be a maximum of 2%. Edges shall be thickened to 6 inches deep by 10 inches wide for erosion protection.
- Trees shall be maintained for a 7 foot vertical clearance from trail surface, across the horizontal clearance width. Equestrian trails shall be maintained for a vertical clearance of 10 feet.
- Asphalt top course shall be class "B" asphalt, and a minimum of 2.5 inches, and maximum of 4 inches thick.
- Base course shall be 5/8 inch minus crushed rock, compacted to 95% density, and a minimum of 4 inches thick.
- Trail width shall be between 4-10 feet, depending on site conditions and designed functionality. Wider trails are not usually installed in Bellevue parks, but consideration will be made if necessary.
- If necessary, area adjacent to trail shall be re-planted with native tree/shrub/groundcover species. If trail crosses a turf area, disturbed turf shall be replaced.
- Trailheads will have developed signage, and ACQ/CBA treated post and rail fence, and a native shrub/tree palette. (see notes in Bark Trails).

Stairs

- Wood will be used that does not leach hazardous materials, and will be ACQ/CBA pressure treated.
- All wood shall be of HEM-FIR #2 grade or better.
- Stair planks shall be ACQ/CBA pressure treated wood, 4" wide and 8" thick. Length is determined by site conditions.
- #4 Rebar will be used for stability and placement.

- Overlap of stairs shall be 4 inches. Each step should be 1 foot wide and consist of 2 planks.
- Stairs shall be placed on stable subgrade.
- Landings shall be composed of fill with 3/8" minus crushed rock, compacted by hand. Railings will be used if edge is 30 inches or greater from grade, or is deemed necessary. Railings shall be installed on right hand side heading upstairs.

Notes:

9.5 Integrated Pest Management

Weed Control

- Weeds are generally tolerated on park trails, until they interfere with trail function. Mechanical methods such as mowing, hula hoeing or resurfacing shall be employed first.
- Approved herbicides shall be used to remove weed species from trail surfaces that cannot be controlled through cultural or mechanical methods.
- On wetland trails, herbicides will only be considered as a last resort.

Insect Control

- Insects are tolerated on trail areas. Only insects that cause a health risk will be controlled, and control will be done by the Department of Health.
- Approved insecticides will be used to remove pests such as hornets and wasps, and only individual nests will be treated.

9.6 Training

- All maintenance crew members are trained in proper trail construction and maintenance techniques and standards. Crew staff are also certified pesticide applicators and certified arborists.



Chapter 10 - Agricultural Areas

The City of Bellevue Parks and Community Services Department manages the last remaining farm lands within the city. These lands comprise approximate 50 acres and are located in the rich peat soils of the Lake Hills Greenbelt and Mercer Slough Nature Park. These farmlands were established in the late 19th and early 20th centuries after clearing and draining opened the land for agriculture. Today these historic agricultural lands help preserve Bellevue's agricultural past, provide community gathering spaces, and increase wildlife habitat. The continued management of these agricultural lands is identified as a component of the master plans for each park. They are managed as farmed wetlands in an environmentally sensitive manner under the same set of multiple use goals consistent with other open spaces land to maximize public benefits.

Notes:

10.2 Definitions

Agricultural area – an area set aside for the use of growing and producing a crop.

Harvester – a machine used for the mechanical harvest of crop, specifically blueberries. Bellevue Parks uses a specially engineered Littau over-the-row harvester to help maximize yields and minimize damage to the surrounding environment.

Crop – a cultivated plant or agricultural good that produces a yield in a particular season.

Row – a straight line of crops placed next to each other possibly designated with a number for easy identification and placement.

Block – a designated number of rows of typically similar crop cultivars

Cultivar – A race or variety of a plant that has been created or selected intentionally, from a natural species, and maintained through cultivation. Varieties are created to enhance a specific characteristics, such as the fruit size, disease resistance, ability to withstand frost, color, etc..

U-pick – refers to the act of letting the customers pick the amount or type of produce desired. This reduces farm labor costs, assists with bird control, allows for more even ripening, and provides a recreational opportunity.

10.3 Background

All remaining agricultural lands within the City are located within the Lake Hills Greenbelt and Mercer Slough Nature Park. Agriculture in the Lake Hills Greenbelt was established in the late 19th century when early pioneers drained the land between Larsen and Phantom lakes

Notes:

by diverting natural flows into Lake Sammamish. Agriculture in the Mercer Slough Farm was established shortly after the creation of the Chittenden locks lowered the level of Lake Washington 9-12 feet in 1917. The blueberry farms were established in the 1940's. Current City managed farms includes the following: 1) 18 acre Mercer Slough Blueberry Farm, 2) 4 acre Kinley Blueberry Farm, 3) 3 acre Kinley agricultural land, 4) 14 acre Larsen Lake Blueberry Farm, and 5) 10 acres Lake Hills Greenbelt truck farm.

Existing Site/Environmental Conditions

- **Current Landscape and Field Condition.** All agricultural fields are located in wetlands associated with the Kelsey Creek drainage that were converted to agriculture during the late 19th and early 20th century. The condition of current plant material may be a good indicator of existing cultural conditions. Master plans, soils types, moisture regimes, nutrient levels, and types of pest populations determine farm renovation and plant selection options. Because of the wet soil, condition and low air circulation associated with these sites, special attention must be given to cultural practices to help reduce root-rotting fungus such as *Phytophthora* and berry-infecting fungus such as *Monilinia vaccinii-corymbosi* (Mummy berry).
- **Soil Type and Condition.** Soil type can ultimately determine the longevity, mortality and health of the crop plants. The soils that make up both farms are predominately peats and/or mucks. Although Blueberries like wet, acidic soil conditions, excessive water may cause root rot problems and must be carefully monitored and controlled through drainage.
- **Drainage.** Because of the subsurface irrigation that exists at both sites, irrigation is typically not necessary. Drainage, however, is essential in helping prevent disease and allowing access to the fields for maintenance activities. The maintenance of existing ditches and cross tiles is essential to help maximize yields and reduce disease.
- **Cultural Conditions.** Cultural conditions such as existing plant health, soil, moisture, sunlight, wind, rainfall, pests, and disease all have an important role in plant health. Environmentally sensitive cultural practices such as mowing, weeding, pruning, mulching, pollination, and drainage are used to increase plant vigor.
- **Safety.** Safety of citizens and farm workers is paramount in farm operations. Designation of U-pick areas, adequate signage, plantation design, plant maintenance, proper materials storage, harvesting coordination, and elimination of undesirable pest populations all help to create a safe environment.
- **Cultivar Selection/Diversity.** Species diversity offers a longer harvesting season, and cross-pollination. Monocultures can be more susceptible to total failure during insect or disease outbreaks.

10.4 Best Management Practices

The farms are a components of Master Plans for both the Lake Hills Greenbelt and Mercer Slough Nature Park. BMP's for farm operations take into account the multiple use aspects of park and seek to utilize environmentally sensitive cultural practices to help maximize public benefit and protect the environment. The Mercer Slough farms are operated using organic farming techniques.

Major horticulture decisions regarding blueberry farms include nutrition, water management, pruning, pollination, harvesting, and weed and pest management. Many cultural operations are timed to the annual growth cycle of the plants which varies from year to year with climate and soil conditions. The table below shows a yearly calendar planning guide.

Notes:

| Growth Period | Approximate Dates | Cultural Operations |
|---------------------------|-------------------------|---|
| Dormant | Nov.- mid March | Prune, apply dormant spray for scale growth if necessary, apply copper for bacteria canker if necessary, and remove diseased and winter-injured tissue. |
| Leaf and flower bud break | Late March – late April | Apply fungicide for primary mummy-berry if needed, control weeds, apply copper if needed. |
| Bloom Period | Late April- late May | Apply fungicides for mummy-berry if needed, apply insecticides to control aphids if needed, introduce bees for pollination. |
| Fruit Development | June and July | Cultivate for weed control in row middles, install bird damage control devices. |
| Harvest | July – September | Harvest and market fruit. |
| Post-harvest Growth | Sept. – mid October | Cultivate to control weeds, remove bird damage control devices. |

Water Management

Blueberry plants have most of their effective root system in the upper 18 inches of soil. Normally, this would subject the plants to drought injury in the hot summer months when water availability decreases, however, The Lake Hills Greenbelt Mercer Slough farms are located within wetlands comprised of hydric peat soils which essentially eliminates the need for irrigation. The need for adequate drainage, however, becomes increasingly important to maintaining plant vigor. Water management at the Mercer Slough farm faces additional drainage issues. Mercer Slough is an adjacent wetland to Lake Washington and the water level is artificially controlled by the Army corps of Engineers through the operation of the Chittenden Locks in Seattle. The water level manipulation by the Corps creates a reverse hydrological effect in the wetland, keeping the level artificially higher in the summer months. This artificial hydrologic environment further exacerbates drainage is-

Notes:

sues that contributes to root rot and mummy-berry. To assist with drainage issues, drainage blocks are separated by drainage ditches. Cross tiles running perpendicular to the drainage ditches pull ground water from the fields in to the ditches. Water is pumped out of the ditches into the Mercer Slough channel via 2 Marlow (#MWS1512D4), 1 PH, 230 volt trash pumps. These pumps have a pumping capacity of approximately 360 gallons/min through 4" PVC pipes. These pumps utilize float valves triggered by rising water levels to control water levels. They also have the ability to grind up small woody debris to prevent clogging. Proper water management ensures present and future fruit production, good floral initiation for the next year's crop, and maintaining fruit skin moisture to prevent cracking or shriveling.

Pruning

Annual pruning is essential to maintain blueberry plant vigor, increase productivity, aid in pest management, maintain fruit quality, and develop appropriate growth habits. Annual moderate pruning produces bushes with the fewest canes, but greatest yields. Proper pruning balances the production of new wood while maintaining fruit production. The best time to prune is during late winter dormancy after carbohydrates produced in late fall have had sufficient time to be stored and winter injured wood can be easily removed, but blueberries can be pruned anytime between the end of fall harvest and spring bud break. Disinfect loppers and pruners between bushes to help prevent the spread of disease.

Technique:

Pruning with newly established plantings (1-2 years old) will primarily be directed at shaping the plant into an upright habit and encouraging new vegetative growth and vigor. Remove the older, twiggy growth from the base of the plants, and strip blossoms to accelerate plant and root growth.

In subsequent years (2-5 years old) prune lightly: remove injured wood and twisted or low growing canes to promote new growth. Remove all but 2-3 newly produced canes at crown level. Seven years old plants should have 10-20 canes of different ages.

Pruning mature plants consists of cutting out old canes and eliminating weak, twiggy growth in the top or outer areas of the bushes to encourage increased budding and large berries. In very mature neglected plantings it may be beneficial to simply crown prune and start from scratch.

The following represents a systematic approach to pruning:

- In older plantings remove 20% of older wood to stimulate new shoot growth.
- Remove low growth that would touch the ground when loaded with fruit.
- Cut off excess new growth that you don't want to develop.

- Remove any damaged canes and twigs.
- Cut out weak, twiggy growth from the top and outer parts of the plant to allow for light penetration and aeration through the plant.
- Prune to shape plant for appropriate harvest method (machine vs. hand picking).

Notes:

Pollination

Although blueberry bushes are capable of setting fruit on 100% of their flowers, 80% is considered a full crop. Honeybee pollination are essential for sustainable yields. The following standards ensure a high probability that proper pollination will occur:

- Make sure the crop is an attractive crop. This entails making sure that pruning cultivated plants with high bud counts, and the chosen cultivar has desirable corollas (shorter corollas have proven to be more attractive to honeybees than longer corollas).
- Ensure that there are at least 4-8 bees/plant at any time during the warmest part of the day during bloom.
- Hives must be in place when a minimum of 5%, and a maximum of 25%, of the flowers have opened.
- Hives must be placed in a sunny wind-sheltered location and preferably facing East.
- Proper pollination requires a minimum 1-3 hives/2 acres, depending on cultivar.
- Hives should be distributed evenly throughout the field: 300ft. apart along every 10th row.
- Remove all competition from plant areas (e.g. dandelions, clover, etc.)

Harvesting

- U-pick and hand harvesting are done on all fields. Clearly designate blocks, varieties and U-pick areas for the public.
- A Littau over-the-row, rotary head style harvester is also used for harvest at the Larsen Lake farm. In order to safely maneuver a harvesting machine, crop rows shall be at least 8 feet wide with a 25 ft. head landing and on <10% slope.

Diseases

- Disease problems shall be accurately identified and management strategies shall be tailored to diseases present in the field in current season.
- Disease resistant cultivars shall be used when planting new sites.
- Mummyberry incidence and severity shall be documented and mapped (noting varietal differences) by determining number of strikes/bush for primary infection and percent infected fruit for secondary infections.
- One or more of the following strategies shall be used to suppress primary infection of mummyberry (where needed):
 1. Apply a thick layer (3-4") of organic mulch beneath bushes to cover fallen fruit in mid-spring.

10. Agricultural Areas

Notes:

2. Rake, disk, or cultivate soil beneath bushes in spring prior to budbreak to disrupt mummyberry spores.
 3. Apply 200 lbs/A 50% urea prills beneath plants in spring prior to budbreak to 'burn' mummyberry spores.
- Diseased wood shall be pruned and destroyed. Pruning tools will be cleaned in a bleach solution between cuts.

Insects

- Insect problems shall be accurately identified and management strategies tailored to insect pests present in the field in current season
- Insects that vector viral and MLO diseases (e.g. aphids and leaf-hoppers) shall be controlled, if necessary.
- Other insect pests (e.g., leaf rollers, gypsy moth, sawfly, Japanese beetle) will be monitored and controlled, if necessary.

Weeds

- Noxious weeds will not be tolerated and shall be removed from sight wherever possible.
- Frequent mowing between rows shall be used to reduce weed competition.
- Invasive weeds may be somewhat tolerated, but shall be controlled through cultural and mechanical.

Vertebrates

- Bird depredation shall be managed with the use of a scare device (usually audio).
- Bellevue parks currently do not have depredation problems with deer or other large ungulates.
- Rodent depredation is generally tolerated on farm fields, but shall be monitored and controlled if necessary.

10.5 Integrated Pest Management

Weed Control

- Noxious weeds will not be tolerated. Mechanical controls will be employed until a tolerable level is met.
- Invasive weed species will be removed through mechanical or cultural practices such as, mowing or hand pulling.
- Some wetland approved herbicides may be employed if necessary.



Insect Control

- Insecticides will be used only if found necessary and approved.
- Spot applications will control product drift. Broad applications will be not be employed.
- Insecticides will not be used when bees are active during bloom.

Disease Control

Mummy-berry is one of the more prevalent diseases to plague a blue-berry field and thrives in wet environments with low air circulation. If mummy-berry is found on any Parks crops the following practices may be employed:

- Increase aeration through proper pruning of plants.
- Increase aeration through mowing. Drying out the site will decrease the possibility of disease spread.
- If cultural methods do not have the desired affect, the use of a fungicide may be employed. Application may be to the individual plants to reduce product drift.

Vertebrate Control

- Increase aeration through proper pruning of plants.
- The use of audio bird chirpers will be utilized to help control birds. Starting in early June. 1-2 machines shall be placed in the center of the field to maximize effect.
- If necessary, Parks may coordinated with WSDA and/or WSU cooperative extension on additional control methods
- Chemicals shall not be used to control vertebrate pests

10.6 Training

- Full time crew personnel are trained in harvester operations, harvesting techniques and safety protocol, proper pruning practices and overall crop health care techniques.
- Part time temps will be trained on all mowing and weed-eating operations as well as harvest assistance, support and safety.

Notes:



References

Some of the information found in this manual has been based on materials extracted from the following sources:

- American Association of Nurserymen (AAN) - 206-789-2900
- Society of American Foresters (SAF) - www.safnet.org
- American Society of Landscape Architects (ASLA) - www.asla.org
- Irrigation Association (IA) - www.irrigation.org
- National Arbor Day Foundation (NAF) - www.arborday.org
- Washington Department of Ecology (WDOE) - www.ecy.wa.gov
- Washington Food and Drug Administration (WFDA) - www.fda.gov
- Washington Department of Fish and Wildlife (WFW) - wdfw.wa.gov
- Washington State Department of Natural Resources (WDNR) - www.dnr.wa.gov
- Environmental Protection Agency (EPA) - www.epa.gov
- National Recreation and Park Association (NRPA) - www.nrpa.gov
- City of Seattle, Department of Parks & Recreation - www.ci.seattle.wa.us/parks

For any additional information, contact the above websites.

Specifications Library - Drawings

DRIVE STAKE INTO FIRM NATIVE SOIL - 3'-0" MIN - TYP.

HEIGHT VARIES, TYP. 1'-0" BELOW LOWEST BRANCH - OBTAIN CITY APPROVAL FOR ALL STAKE HEIGHTS ON PUBLIC PROPERTY - TYP.

PROVIDE (2) - MIN. SPARE LINKS TO ADJUST TENSION - TYP.

STAKING PLAN

POSITION TIE W/ 1/2" CLEAR ON ALL SIDES OF TRUNK - TYP.

#5 "CHAINLOCK" PLASTIC TREE TIES - ADJUST HEIGHT AS DIRECTED (SEE INSET PLAN)

2" DIA. FIR STAKES

1'-10"

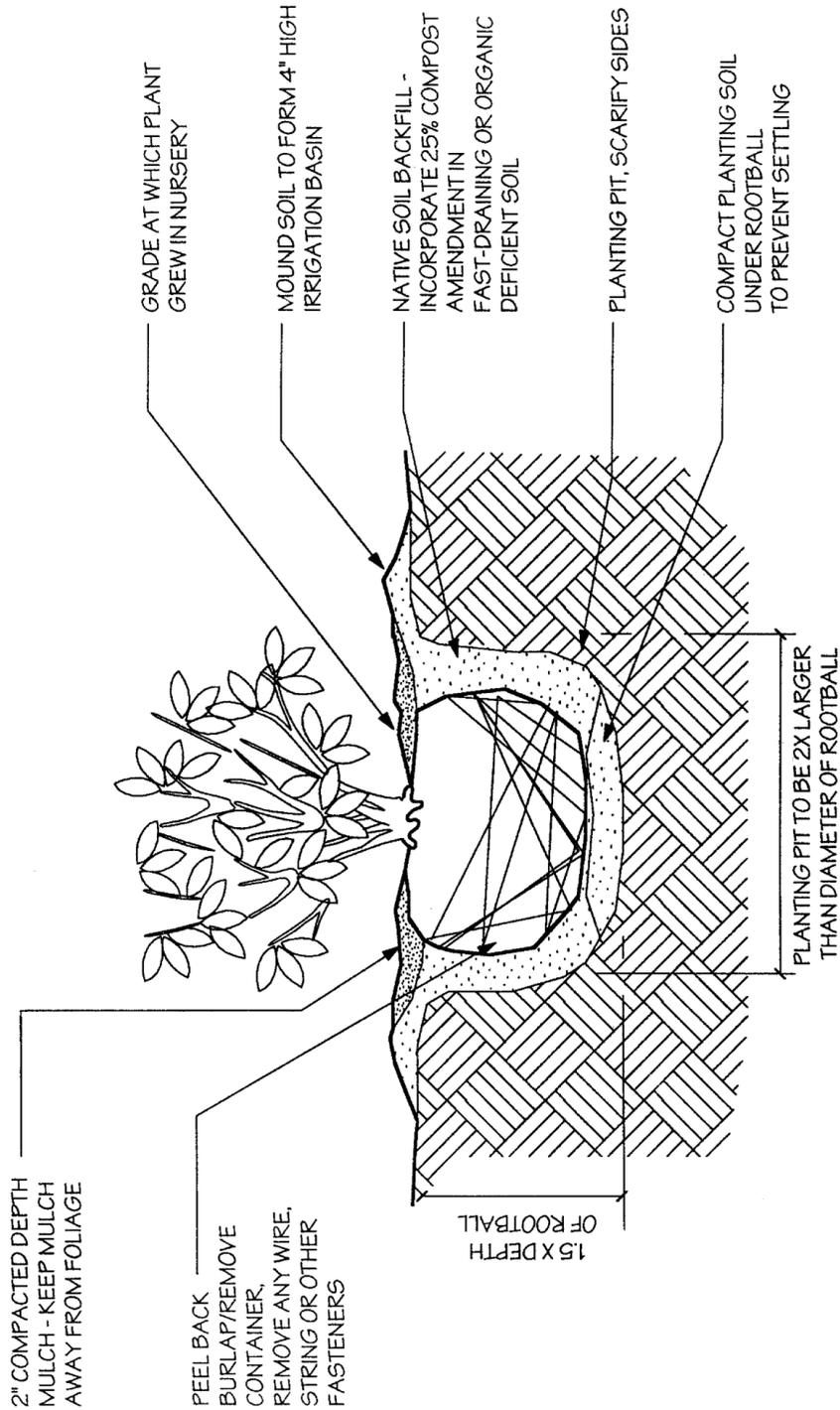
2'-5"

3 X DIA. OF ROOTBALL

| | |
|----------------|--------------|
| DRAWING NUMBER | 32 |
| SCALE | 1/2" = 1' 0" |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |

TITLE : PLANTING, TREE





City of Bellevue

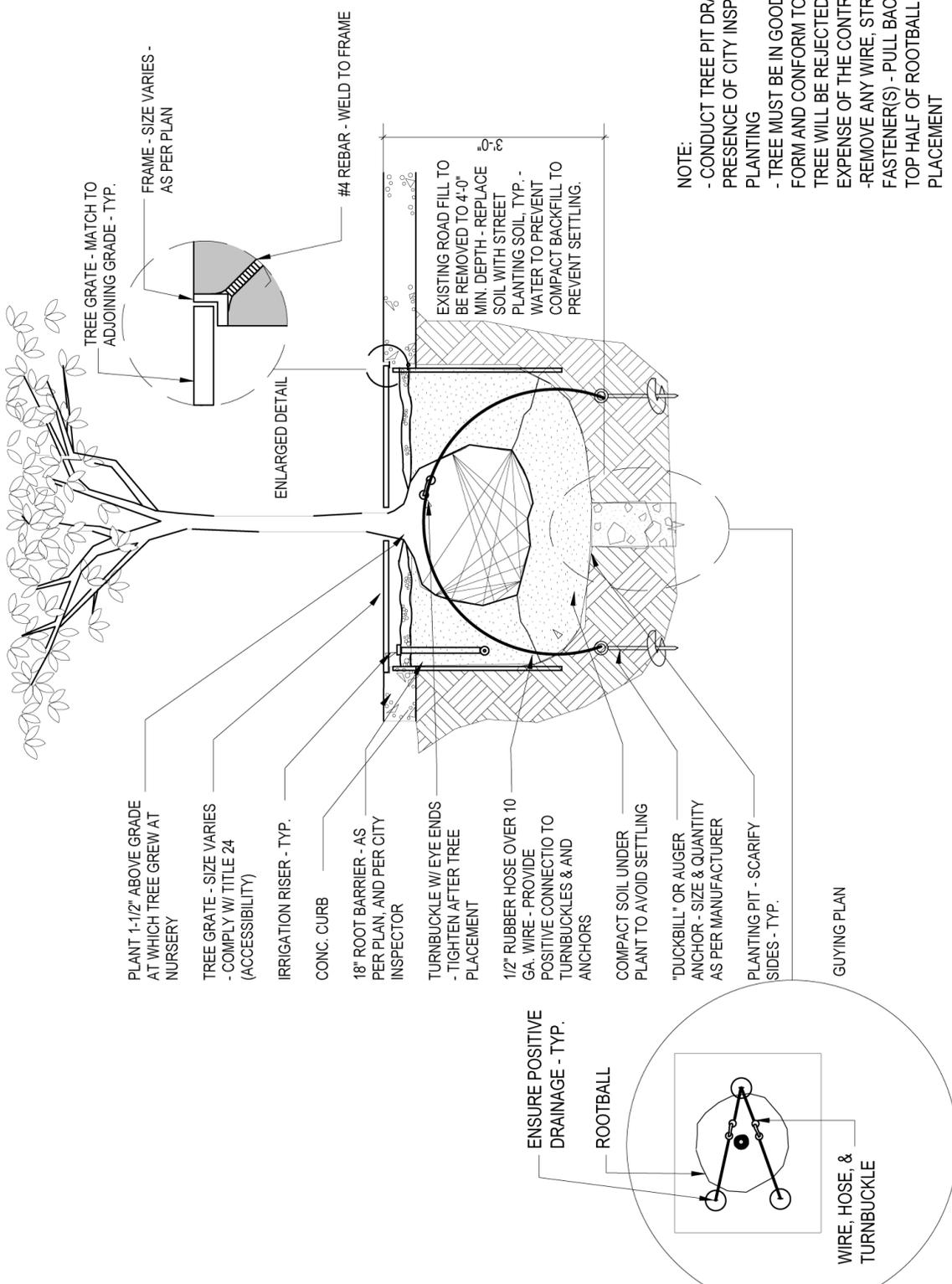
NO SCALE

TITLE:

TYPICAL SHRUB PLANTING

DRAWING #33

REVISED MARCH, 1996



NOTE:

- CONDUCT TREE PIT DRAINAGE TEST, IN PRESENCE OF CITY INSPECTOR, PRIOR TO PLANTING
- TREE MUST BE IN GOOD HEALTH AND FORM AND CONFORM TO ANSI Z60 OR TREE WILL BE REJECTED ON SITE AT THE EXPENSE OF THE CONTRACTOR
- REMOVE ANY WIRE, STRING, OR OTHER FASTENER(S) - PULL BACK BURLAP FROM TOP HALF OF ROOTBALL PRIOR TO PLACEMENT

TITLE : PLANT - TREE, GRATE/STAKE

| | |
|----------------|------------|
| DRAWING NUMBER | 34 |
| SCALE | 1" = 1' 0" |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |



NOTES:

Tree Protection During Construction

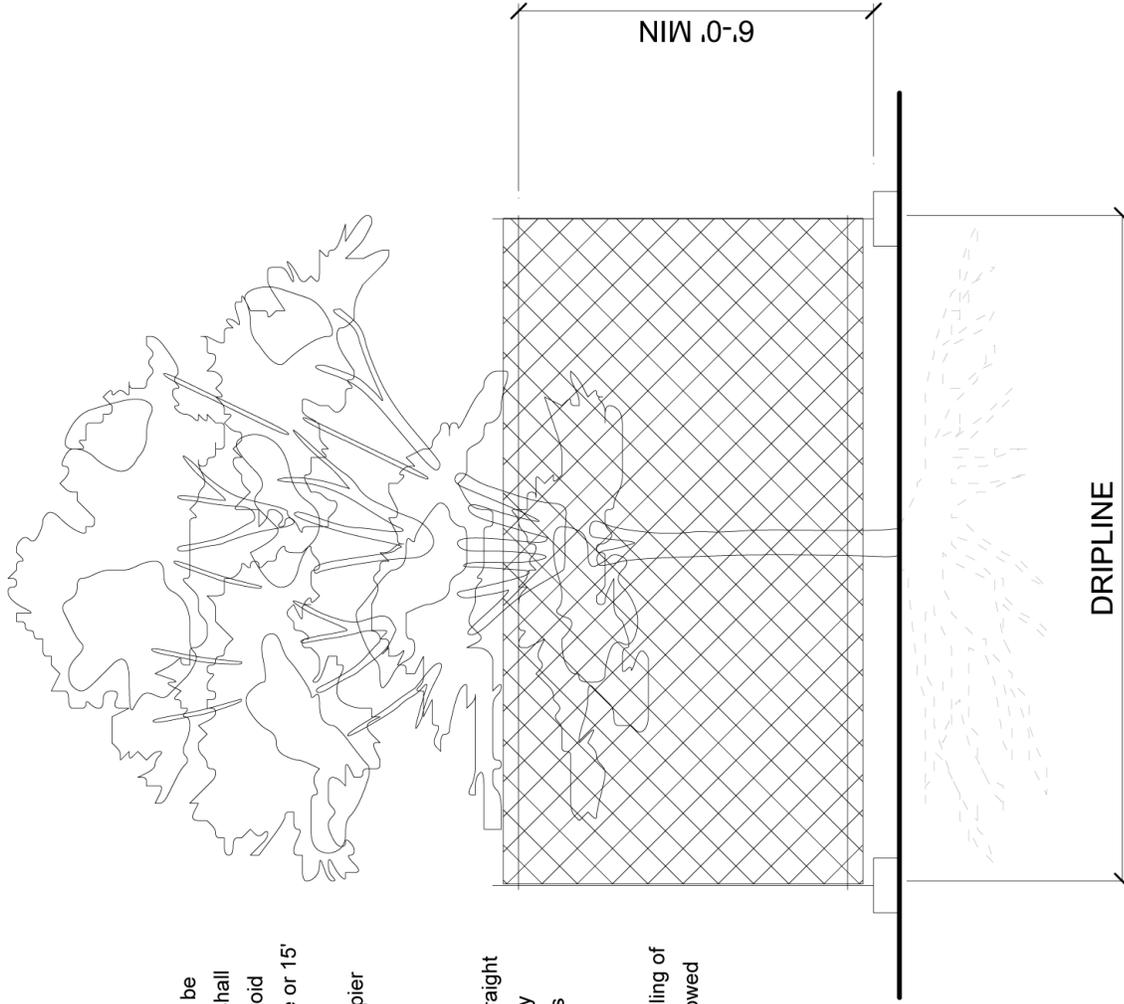
A six foot-high temporary chainlink fence shall be placed at dripline of tree to be saved, or a distance of 15' from the trunk, whichever is greater. The fence shall completely encircle the tree(s). Install fence posts using pier blocks only. avoid driving posts or stakes into major roots. Fencing may extend beyond dripline or 15' if plan design allows.

Owner may permit alternative fencing methods if site prohibits installation of pier blocks (steep slopes, soft soils, etc.).

Treatment of Roots Exposed During Construction

For roots over 1" in 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.

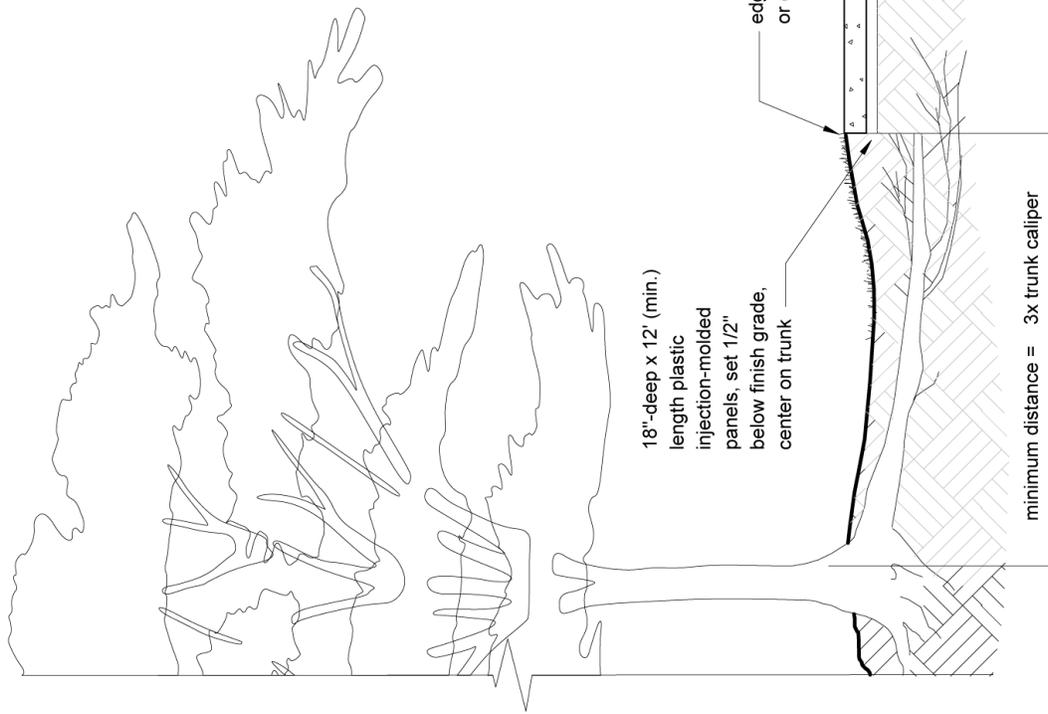
Work within protection fence shall be done manually. No excavation, stockpiling of materials, vehicular traffic, or storage of equipment or machinery shall be allowed within the limit of the fencing.



| | |
|----------------|--------------|
| DRAWING NUMBER | 35 |
| SCALE | 3/8" = 1' 0" |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |



TITLE: PLANT, TREE PROTECTION



NOTES:

Treatment of roots exposed during construction: for roots over 1" in 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.

All pruning to be done to ANSI A300 standards.

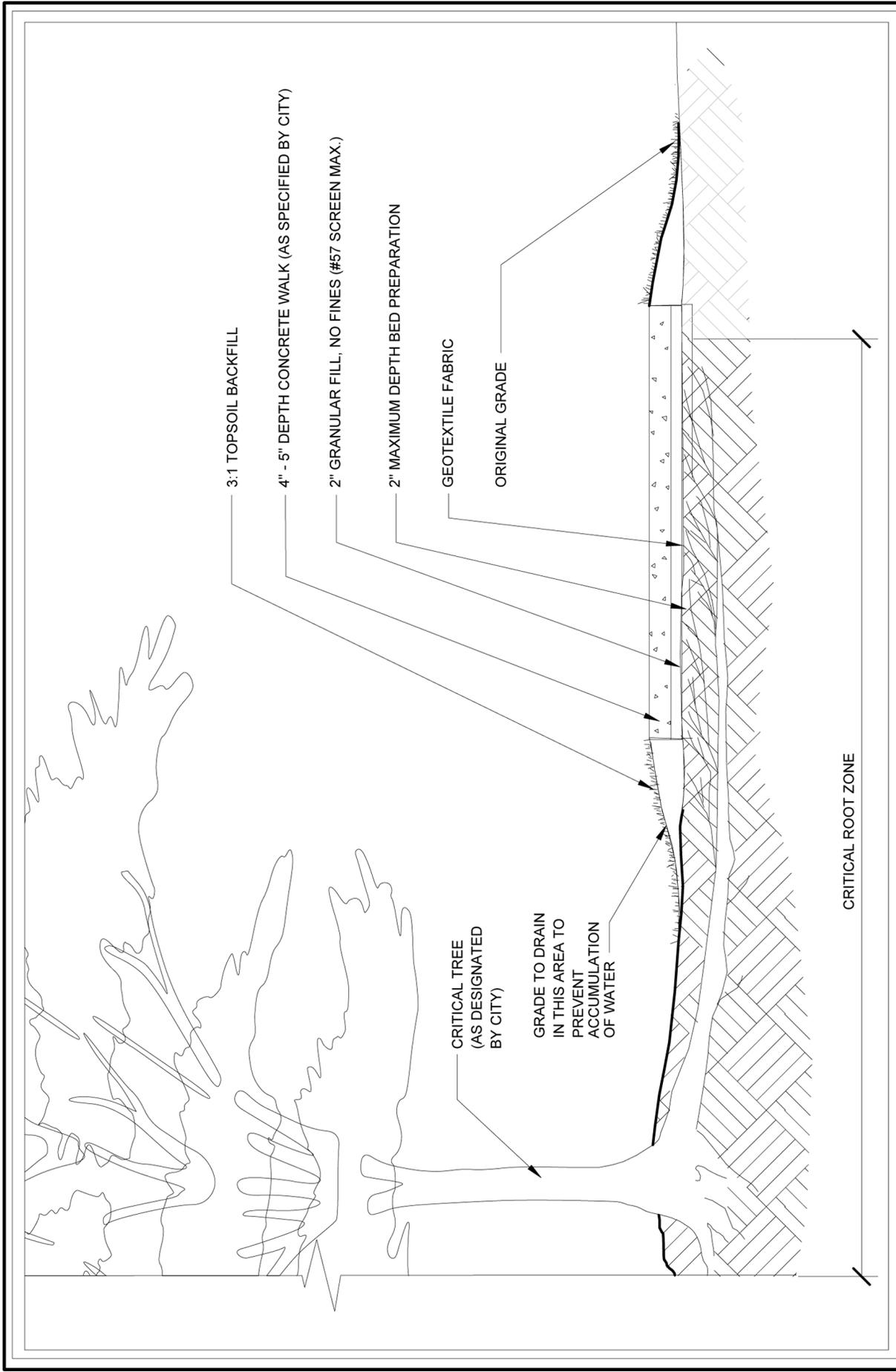
Consult certified arborist regarding thinning of foliar canopy.

Root pruning should not be performed within five months of local high-wind season.

| | |
|----------------|--------------|
| DRAWING NUMBER | 36 |
| SCALE | 1/4" = 1' 0" |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |

TITLE : PLANT, ROOT BARRIER

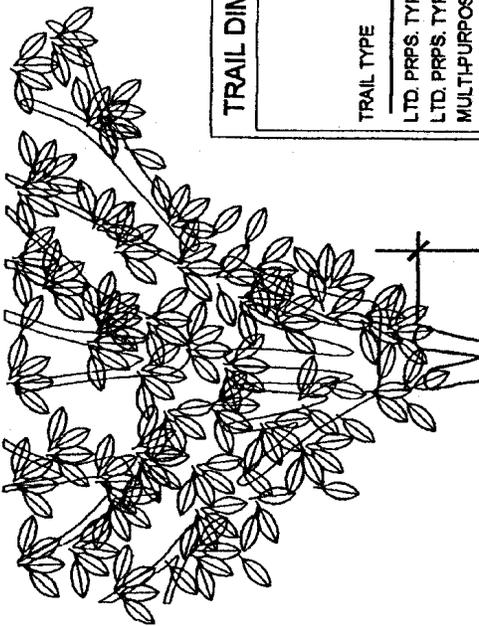




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| DRAWING NUMBER | 37 |
| SCALE | 3/8" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

PLANT, CRITICAL ROOT ZONE
TITLE: UNDER CONCRETE WALK

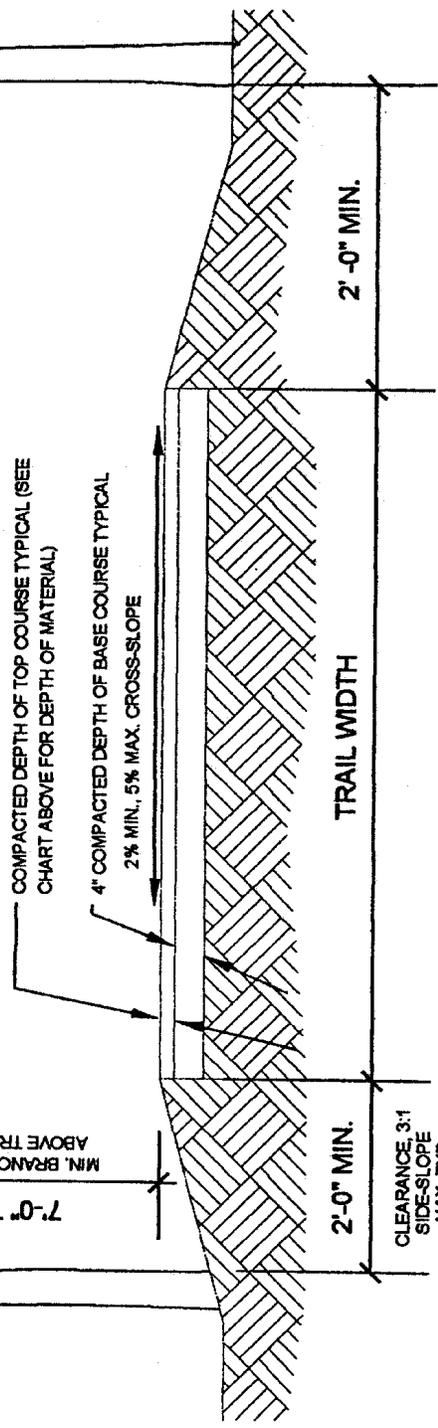




| TRAIL DIMENSIONS & MATERIALS BY TRAIL TYPE | | | |
|--|-------------|--|----------------------|
| TRAIL TYPE | TRAIL WIDTH | TOP COURSE MATERIAL & DEPTH | BASE COURSE MATERIAL |
| LTD. PRPS. TYPE 1 | 4'-5" | 4" DEPTH MEDIUM WOOD CHIPS | NATIVE SOIL* |
| LTD. PRPS. TYPE 2 | 4'-5" | 2" DEPTH 1/4" MINUS C.R. | 3/4" MINUS C.R.* |
| MULTI-PURPOSE | 6'-10" | 4" DEPTH 1/4" MINUS C.R. OR CL. 'B' ASPH. | 5/8" MINUS C.R.* |
| PAVED | 6'-10" | 2 1/2"-4" CL. 'B' ASPH. OR 3 1/2"-5" CONC.** | 5/8" MINUS C.R. |
| BICYCLE | 10'-12" | 2 1/2"-4" DEPTH CL. B ASPHALT** | 5/8" MINUS C.R. |
| EQUESTRIAN | 4'-5" | 4" DEPTH MEDIUM WOOD CHIPS | NATIVE SOIL |

* INDICATES FILTER FABRIC BETWEEN COURSES **INDICATES AS SPECIFIED BY CITY

7'-0" TYPICAL
MIN. BRANCH CLEARANCE
ABOVE TRAIL SURFACE



2'-0" MIN.

TRAIL WIDTH

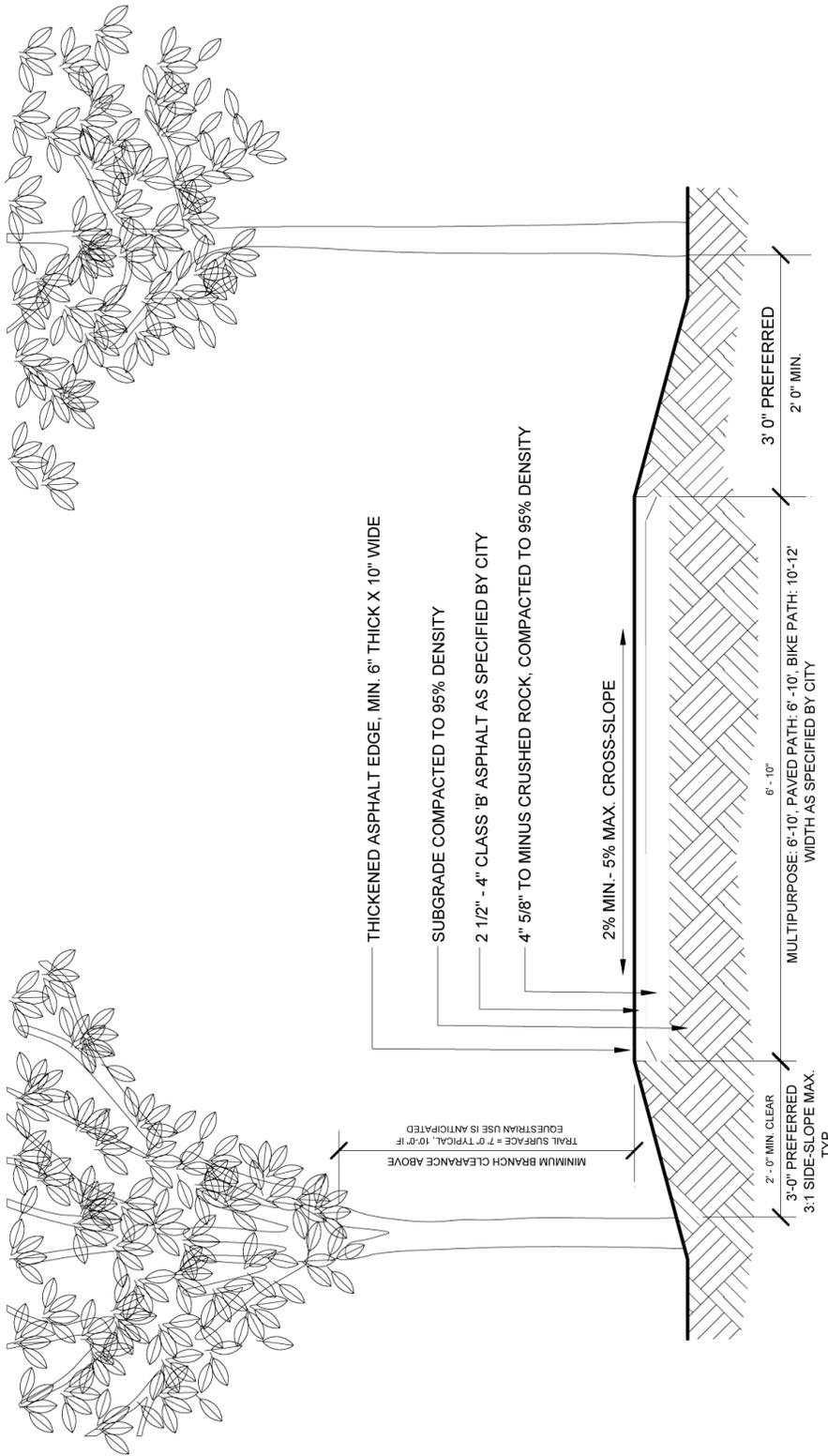
2'-0" MIN.

CLEARANCE 3:1
SIDE-SLOPE
MAX. TYP.

| | |
|----------------|--------------|
| DRAWING NUMBER | 56 |
| SCALE | 1/2" = 1'-0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |



TITLE: TRAIL, DIMENSION & MATERIAL OPTIONS

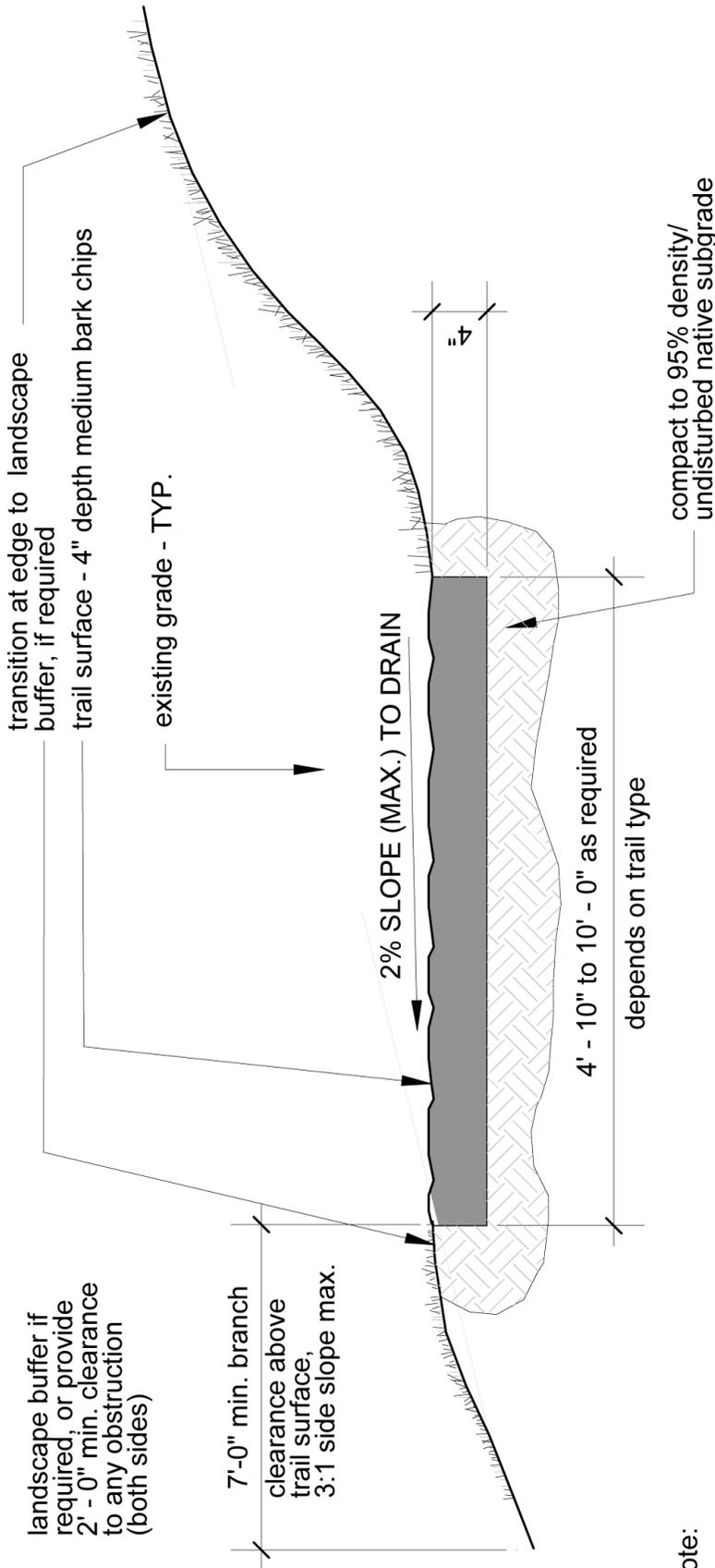


- NOTES:
1. ALL PLANS MUST BE APPROVED BY THE CITY PRIOR TO CONSTRUCTION OF THE TRAIL. TRAIL CENTERLINE TO BE STAKED IN FIELD BY CONTRACTOR AND APPROVED BY THE APPROPRIATE CITY INSPECTOR.
 2. ALL HAZARD TREES AND TREE LIMBS, AS DEFINED BY THE WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES HAZARD TREE BULLETIN, SHALL BE FELLED AND REMOVED FROM THE SITE.
 3. SUBGRADE TO BE TREATED WITH AN APPROVED HERBICIDE PRIOR TO PLACING ASPHALT.
 4. ONE-WAY BIKE PATH TO BE A MINIMUM OF 8 FEET WIDE.

| | |
|----------------|--------------|
| DRAWING NUMBER | 57 |
| SCALE | 3/8" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

TITLE: TRAIL, ASPHALT





Note:

- provide drainage as required
- trail alignments shall be reviewed & approved by City prior to construction
- provide woven filter fabric between wood chips & subgrade as required by City

| | |
|----------------|------------|
| DRAWING NUMBER | 58 |
| SCALE | 1" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

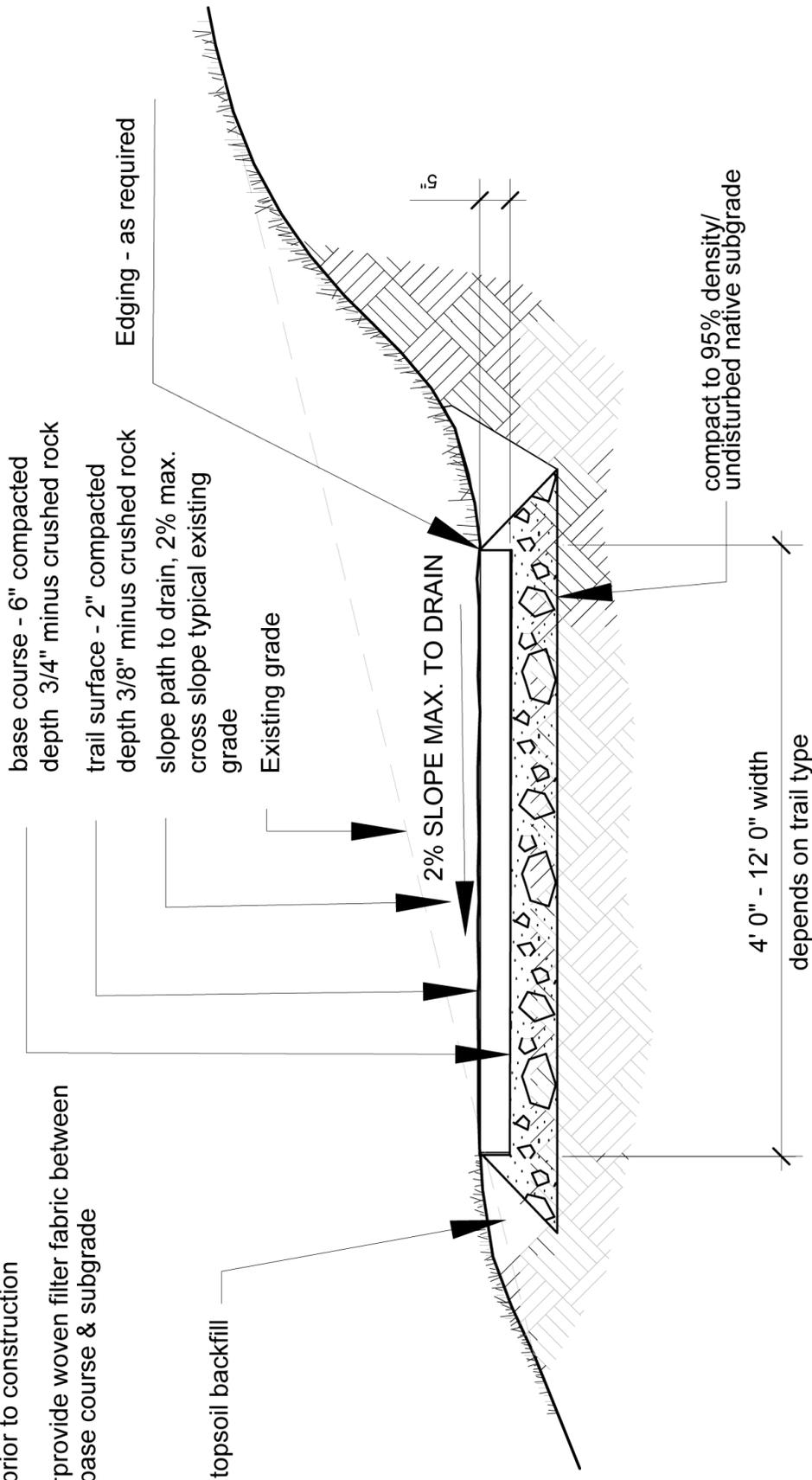
TITLE : TRAIL, WOOD CHIP



City of Bellevue

Notes:

1. provide positive drainage away from trail
2. trail alignments shall be reviewed & approved by City prior to construction
3. provide woven filter fabric between base course & subgrade

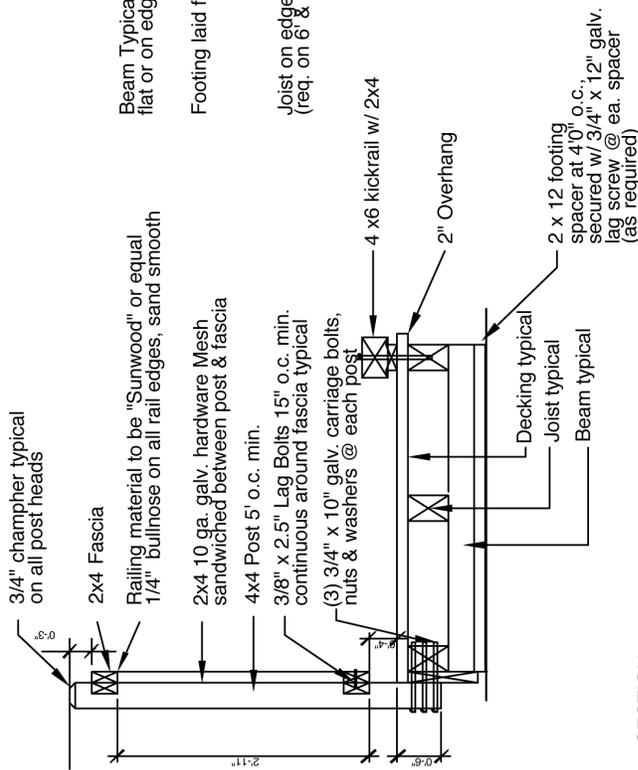


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| DRAWING NUMBER | 59 |
| SCALE | 3/8" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

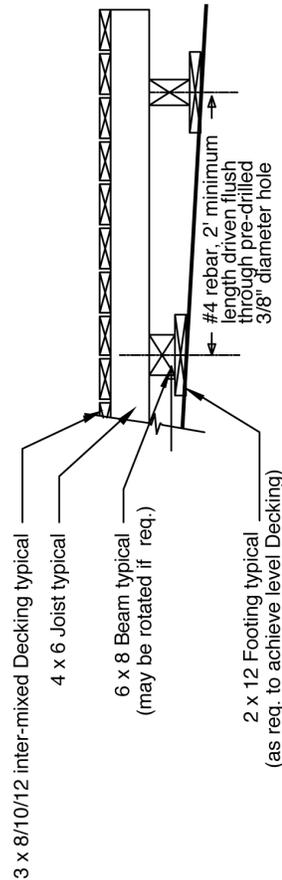
TITLE: TRAIL, CRUSHED ROCK



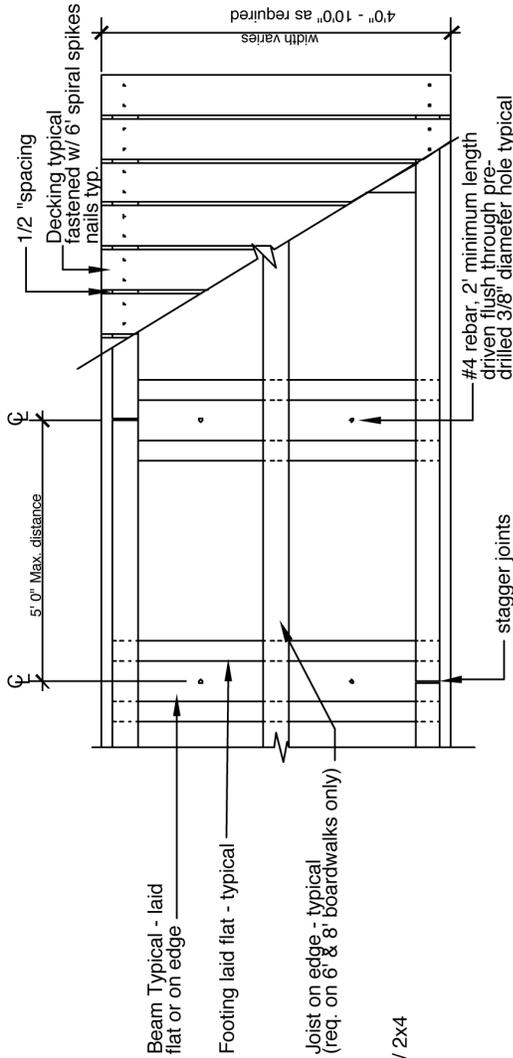
Note: handrail required where bridge surface is greater than 30" above ground level only



SECTION



ELEVATION



PLAN VIEW

Note: all wood shall be 'hem-fir', #2 or better (except decking, 'hem-fir #1 w/rough-sawn walking surface). all wood ACZA pressure-treated per LP-22 or as approved by owner. fasten all materials w/ 32d galvanized common nails unless otherwise indicated.

| | |
|----------------|--------------|
| DRAWING NUMBER | 60 |
| SCALE | 1/2" = 1' 0" |
| REVISION DATE | Draft - 2/02 |
| DEPARTMENT | PARKS |

TITLE : FOOTBRIDGE & BOARDWALK



City of Bellevue

typical position of existing grade

6 x 8 preservative-treated timber step, two per tread

Note: all wood shall be "hem-fir", #2 or better (w/rough-sawn walking surface). All wood ACZA pressure-treated per LP-22, .6 retention or as approved by City.

#4 rebar, 3'-0" long, install 1'-0" o.c. on all sides of landing & 2'0" o.c min. through stair treads

4 3/8"

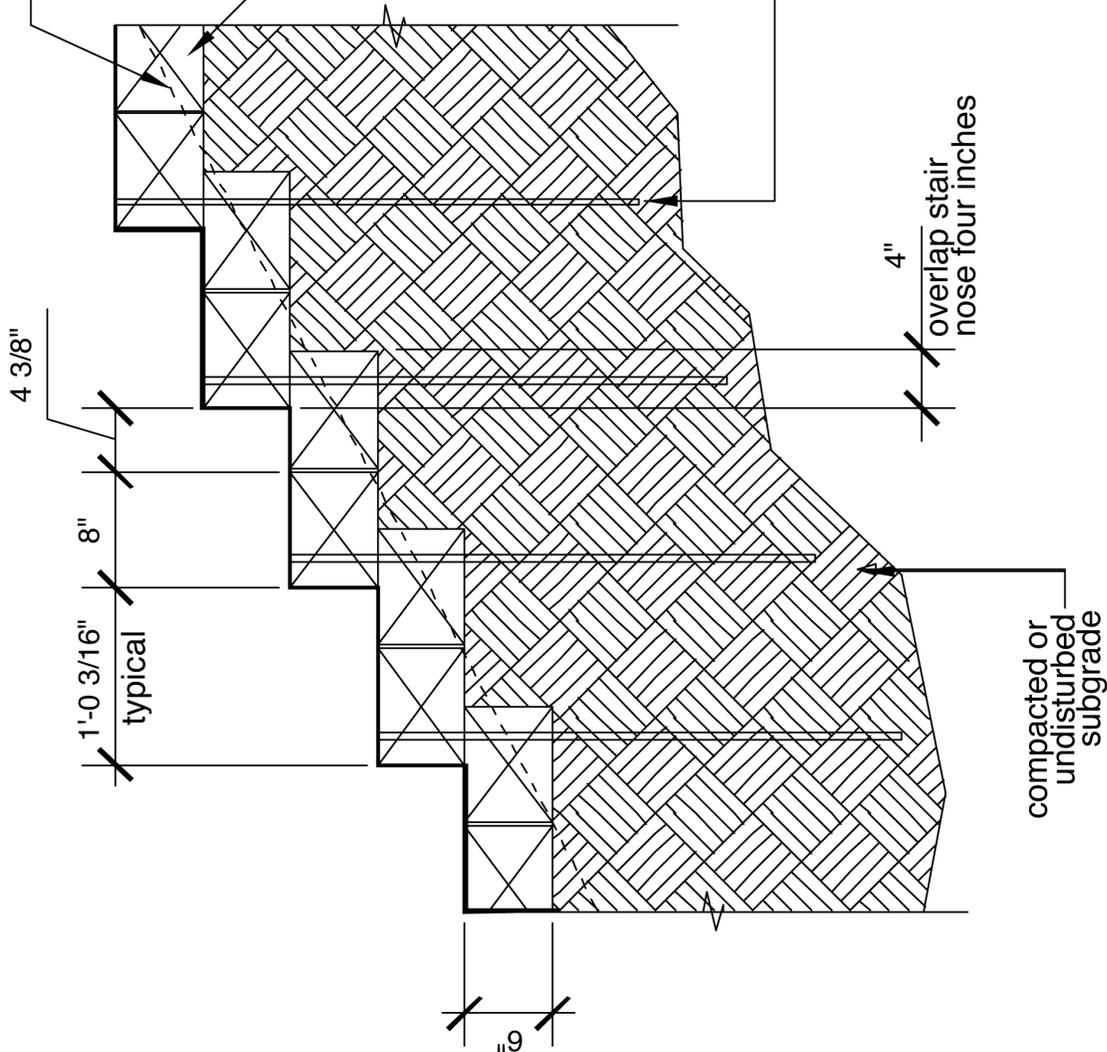
8"

1'-0 3/16"
typical

4"

overlap stair nose four inches

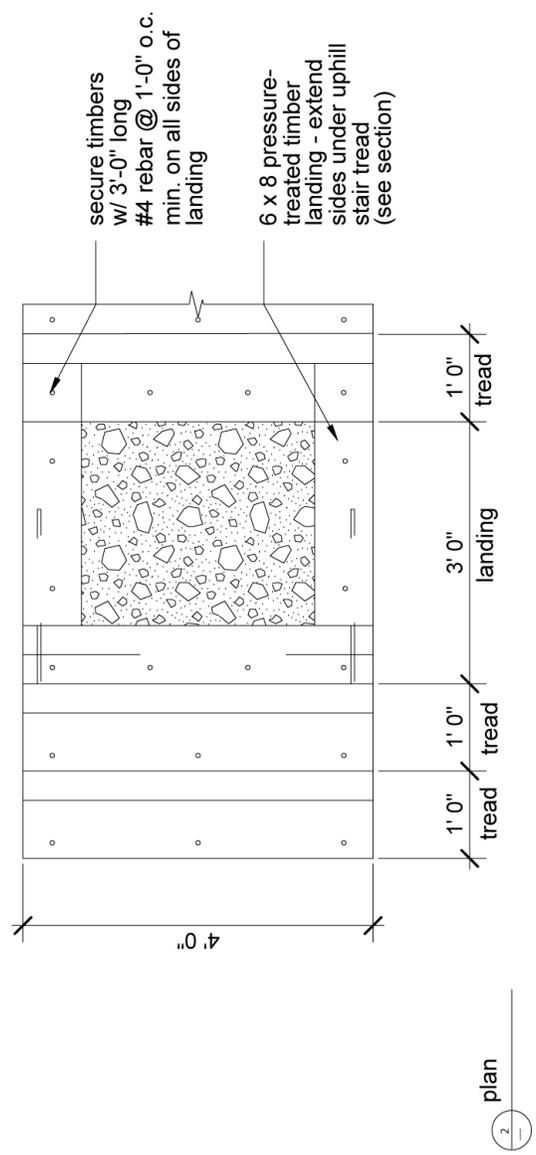
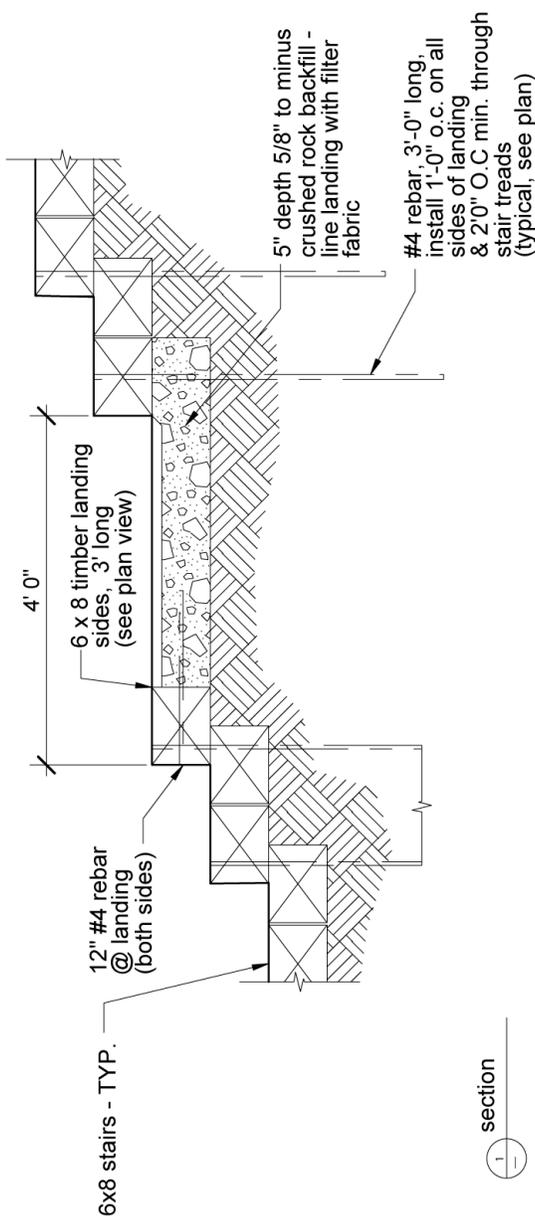
compacted or undisturbed subgrade



| | |
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| DRAWING NUMBER | 61 |
| SCALE | 1" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

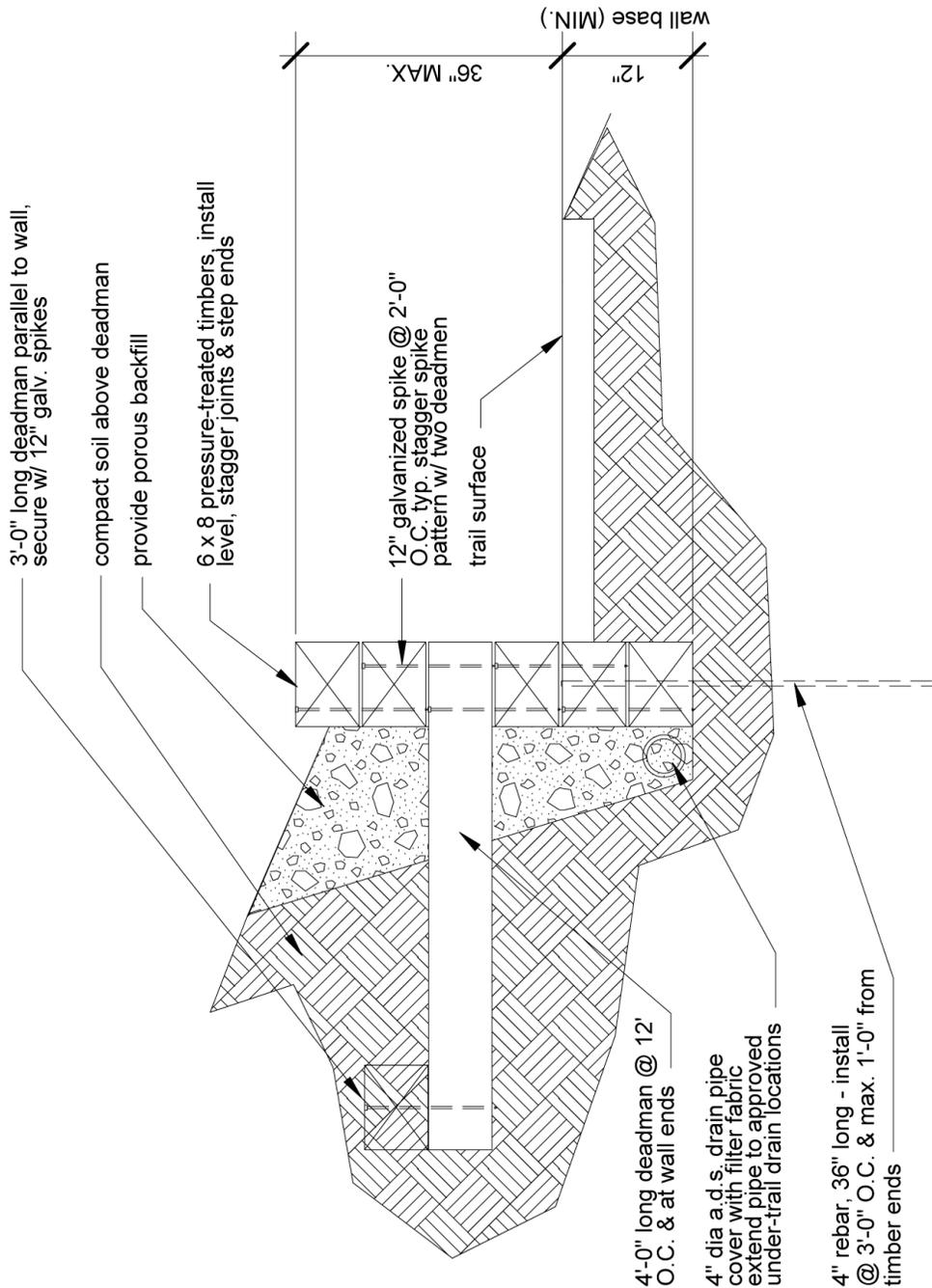
TITLE : TRAIL, TIMBER STAIRS





Note: all wood shall be 'hem-fir', #2 or better (w/rough-sawn walking surface). all wood ACZA pressure-treated per LP-22, .6 retention, or as approved by City.

| | | | | | |
|--|--|--|--|----------------|--------------|
|  <p>City of Bellevue</p> | | <p>TITLE: TRAIL, TIMBER STAIR LANDING</p> | | | |
| | | | | DRAWING NUMBER | 62 |
| | | | | SCALE | 1/4" = 1' 0" |
| | | | | REVISION DATE | 3/01 |
| DEPARTMENT | | PARKS | | | |

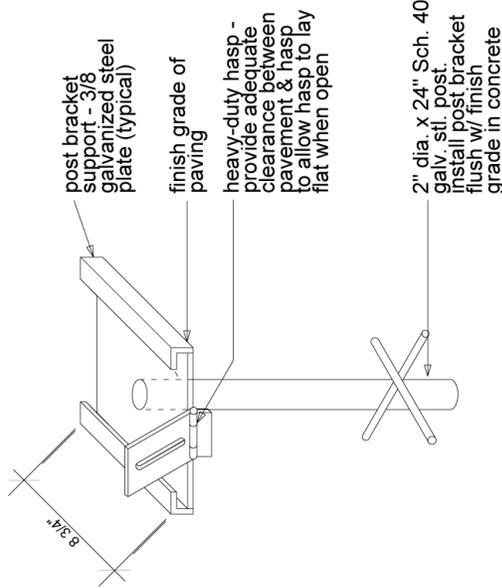
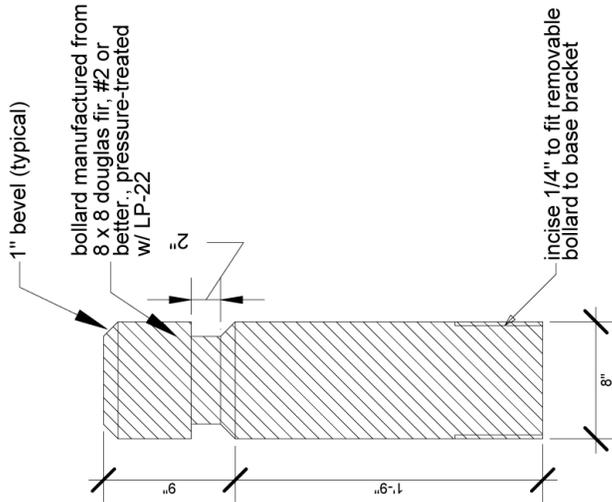
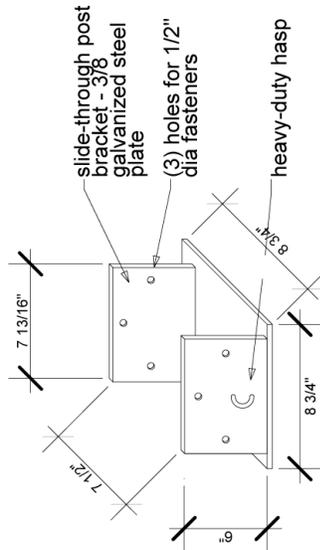


Note: all wood shall be 'hem-fir', #2 or better, all wood ACZA pressure-treated per LP-22 - .6 retention, or as approved by Owner.

| | |
|----------------|------------|
| DRAWING NUMBER | 63 |
| SCALE | 1" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

TITLE : WALL, TIMBER RETAINING





NOTES:
 removable bollard bases are set in a 12" diameter hole 30" deep, and backfilled with concrete. lock hasp faces the street

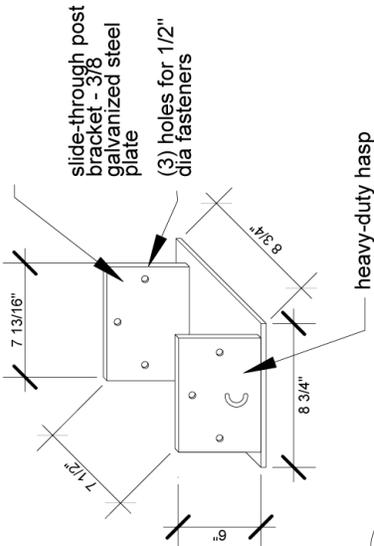
| | |
|----------------|------------|
| DRAWING NUMBER | 64 |
| SCALE | 1" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

BOLLARD & MISSING PLACEMENT

TITLE :

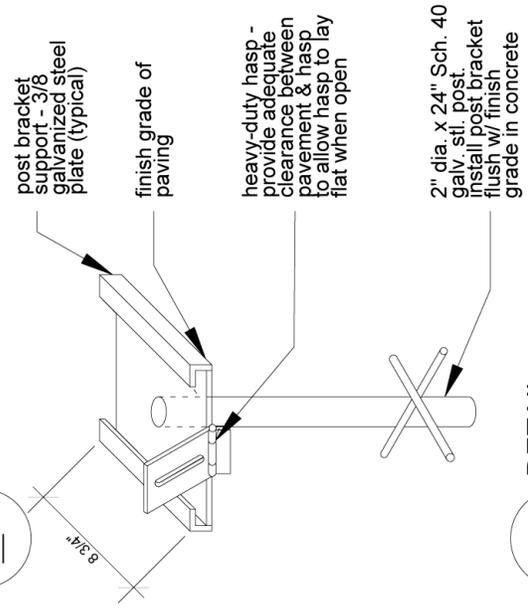


City of Bellevue



1
—

DETAIL

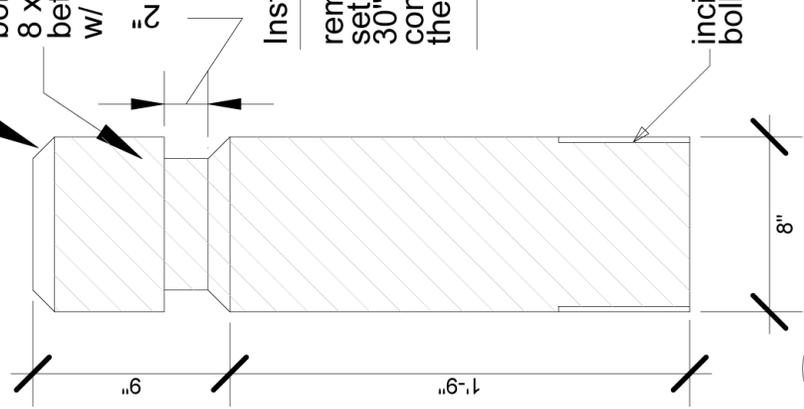


2
—

DETAIL

1" bevel (typical)

bollard manufactured from 8 x 8 douglas fir, #2 or better., pressure-treated w/ LP-22



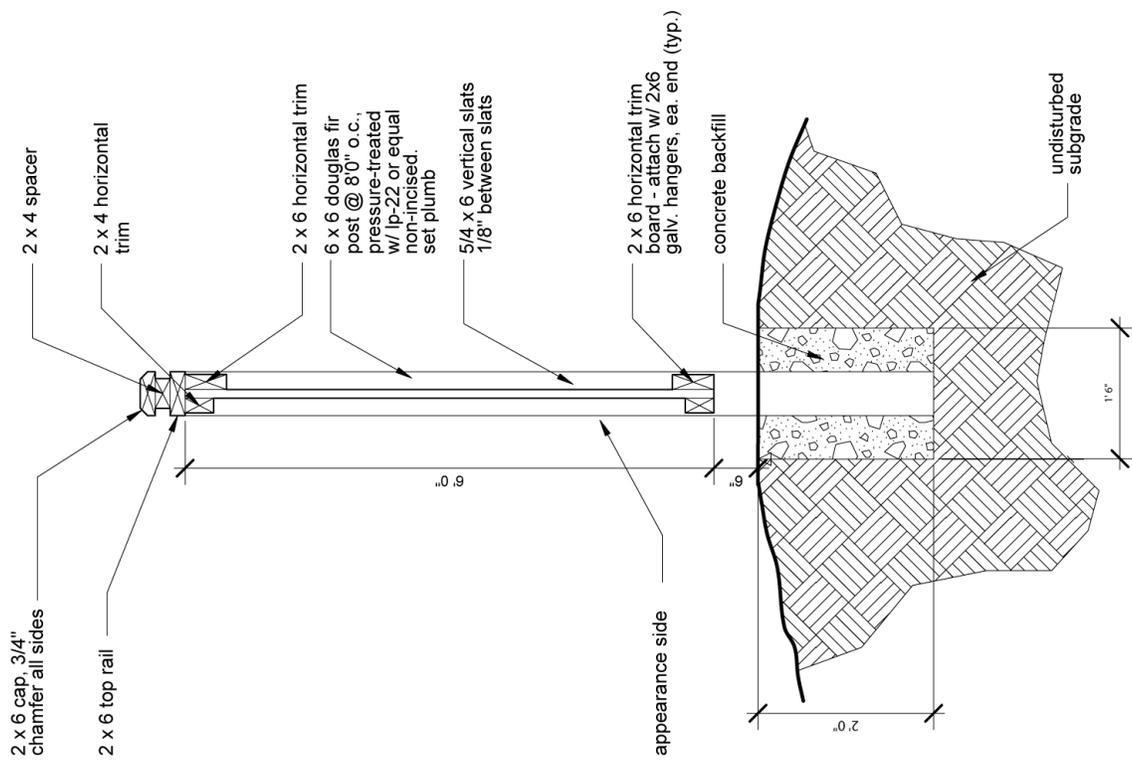
3
—

BOLLARD DETAIL

| | |
|----------------|----------|
| DRAWING NUMBER | 65 |
| SCALE | AS SHOWN |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

TITLE : BOLLARD, REMOVABLE



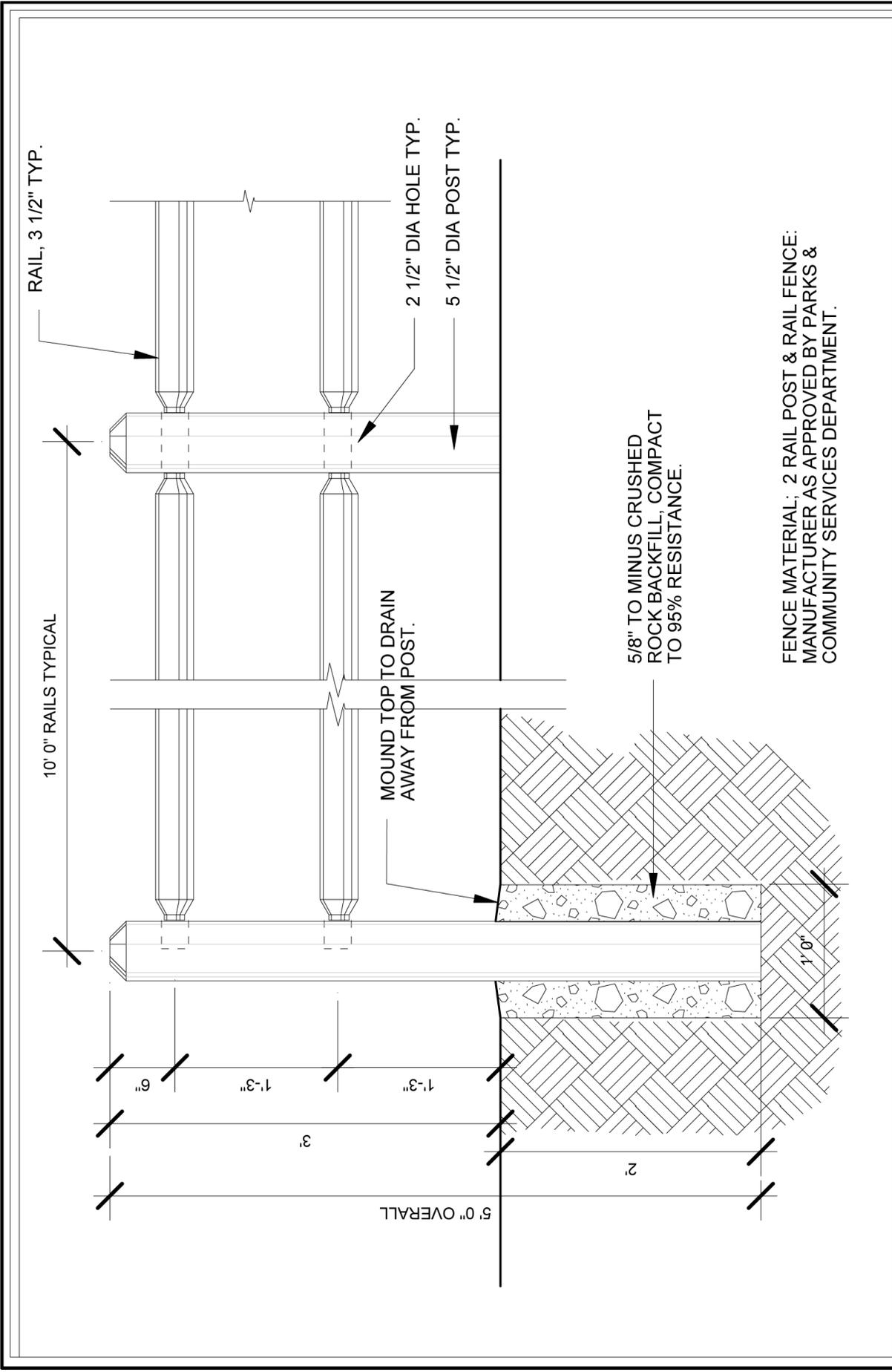


NOTE:
 all wood to be western red cedar, grade 'B' or better unless otherwise indicated
 fasten all materials w/ 10d galvanized common nails unless otherwise indicated.

TITLE : FENCE, BOARD

| | |
|----------------|--------------|
| DRAWING NUMBER | 69 |
| SCALE | 1/2" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

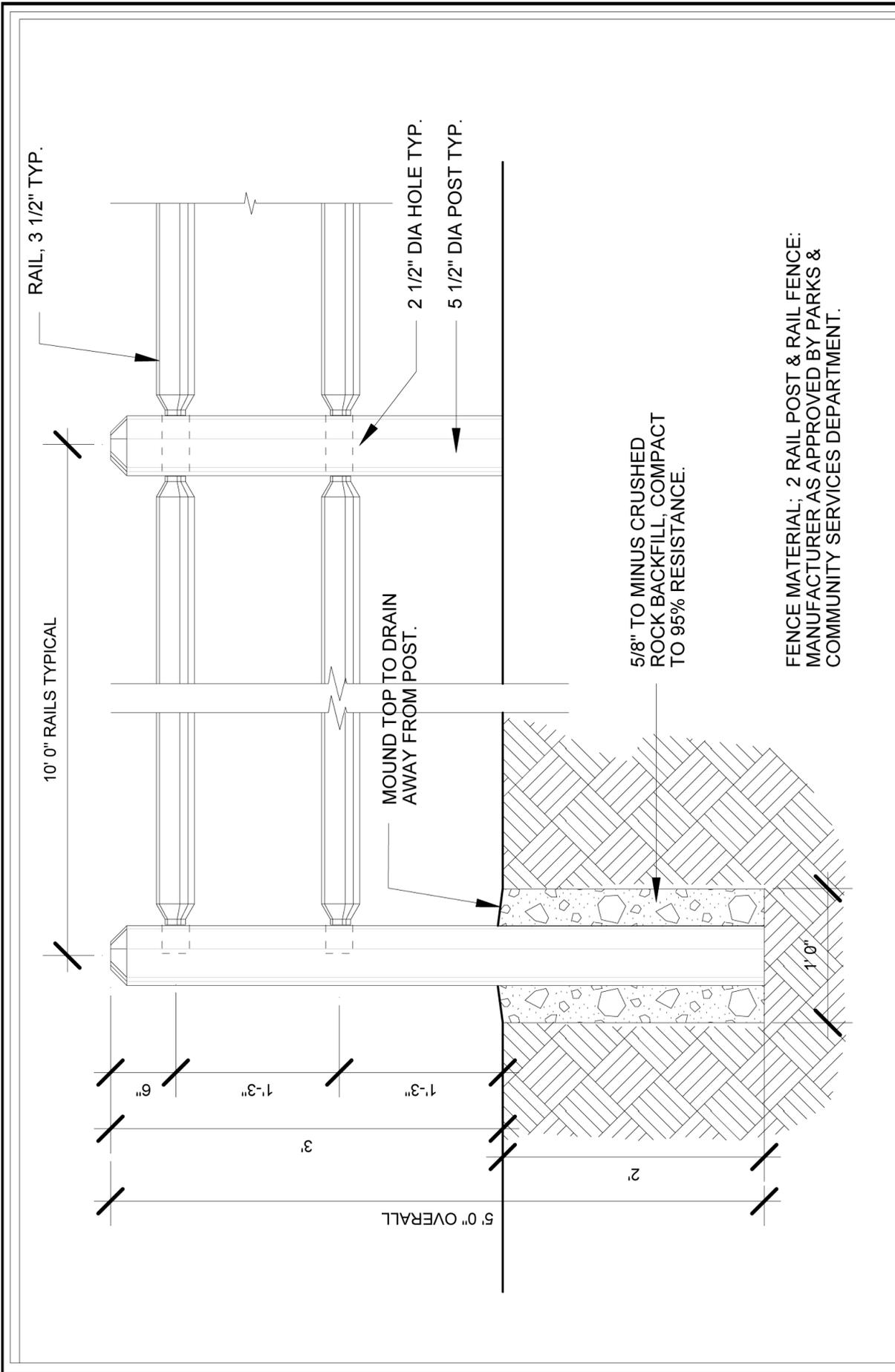




| | |
|----------------|--------------|
| DRAWING NUMBER | 70 |
| SCALE | 1/2" = 1' 0" |
| REVISION DATE | DRAFT |
| DEPARTMENT | PARKS |

TITLE : FENCE - POST & (2) RAIL W/FABRIC

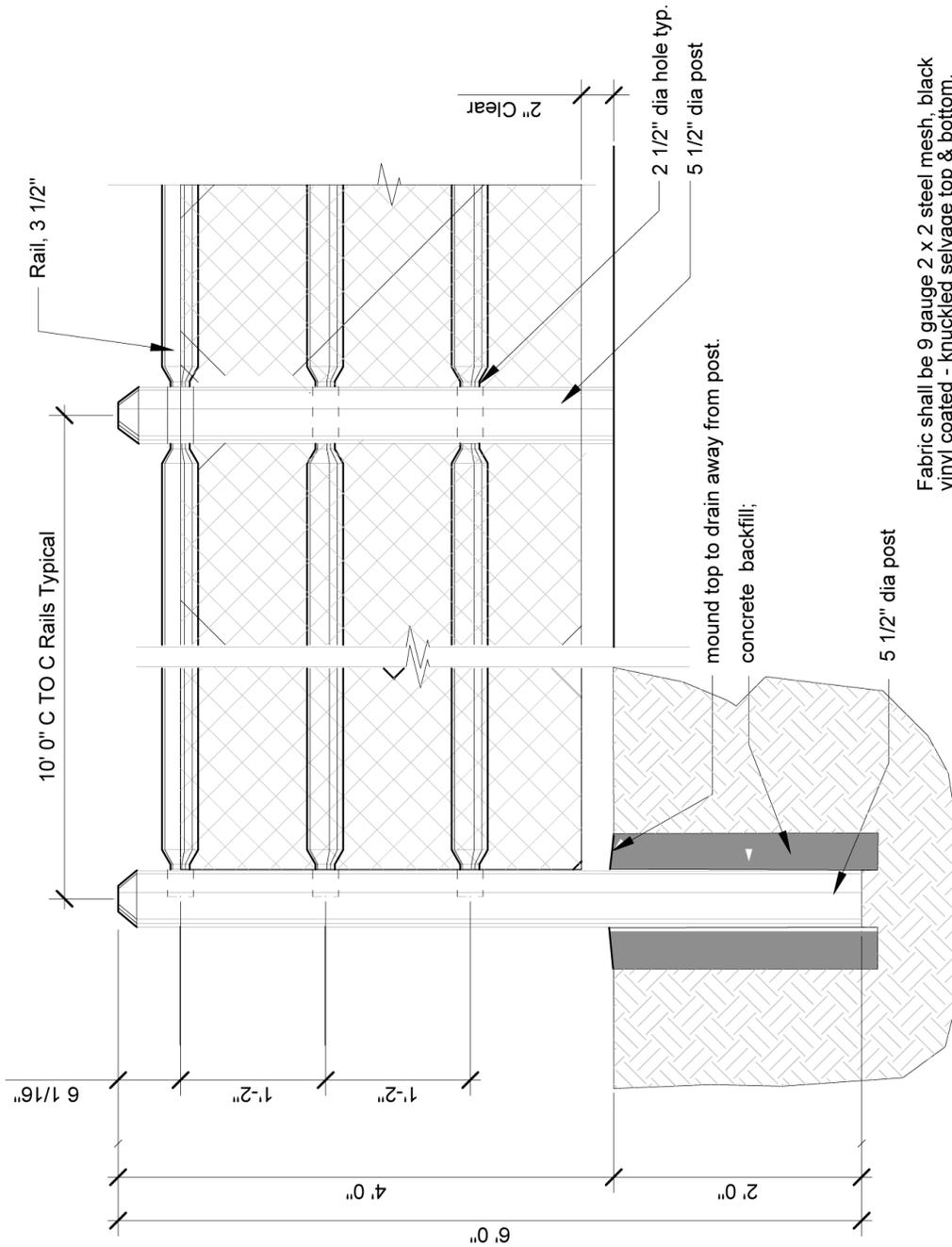




| | |
|----------------|--------------|
| DRAWING NUMBER | 71 |
| SCALE | 1/2" = 1' 0" |
| REVISION DATE | DRAFT |
| DEPARTMENT | PARKS |

TITLE : FENCE - POST & (2) RAIL W/FABRIC





Fabric shall be 9 gauge 2 x 2 steel mesh, black vinyl coated - knuckled selvage top & bottom. Secure to posts & rails with 7/8" galv. staples @ 1' - 0" on center - fabric to be attached on side facing away from path. Fence material, 3 rail post & rail fence: manufacturer as approved by Owner.

| | |
|----------------|--------------|
| DRAWING NUMBER | 72 |
| SCALE | 3/4" = 1' 0" |
| REVISION DATE | DRAFT |
| DEPARTMENT | TRANS |

TITLE: FENCE - POST & (3) RAIL

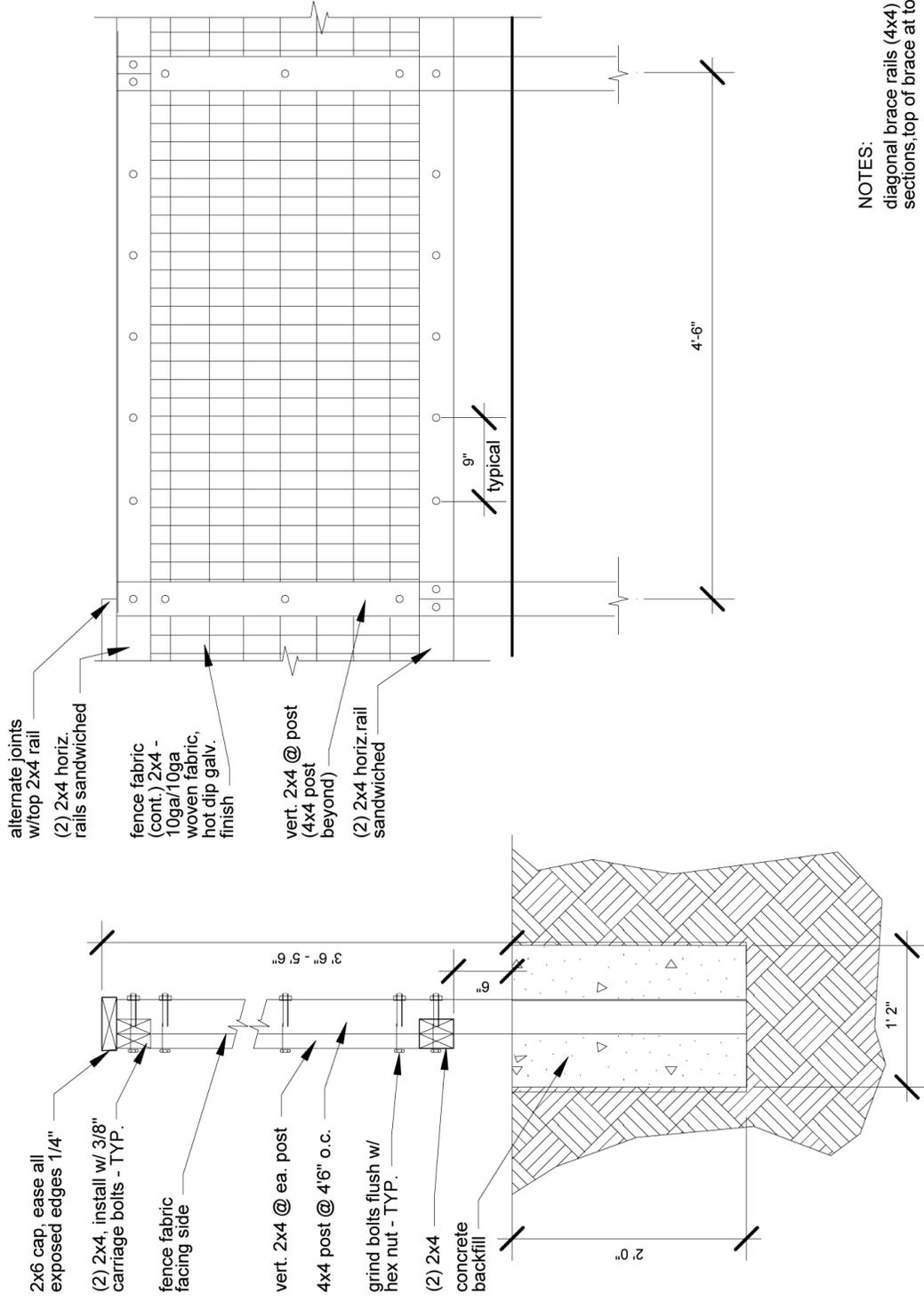




City of
Bellevue

TITLE : FENCE, BOARD WITH FABRIC

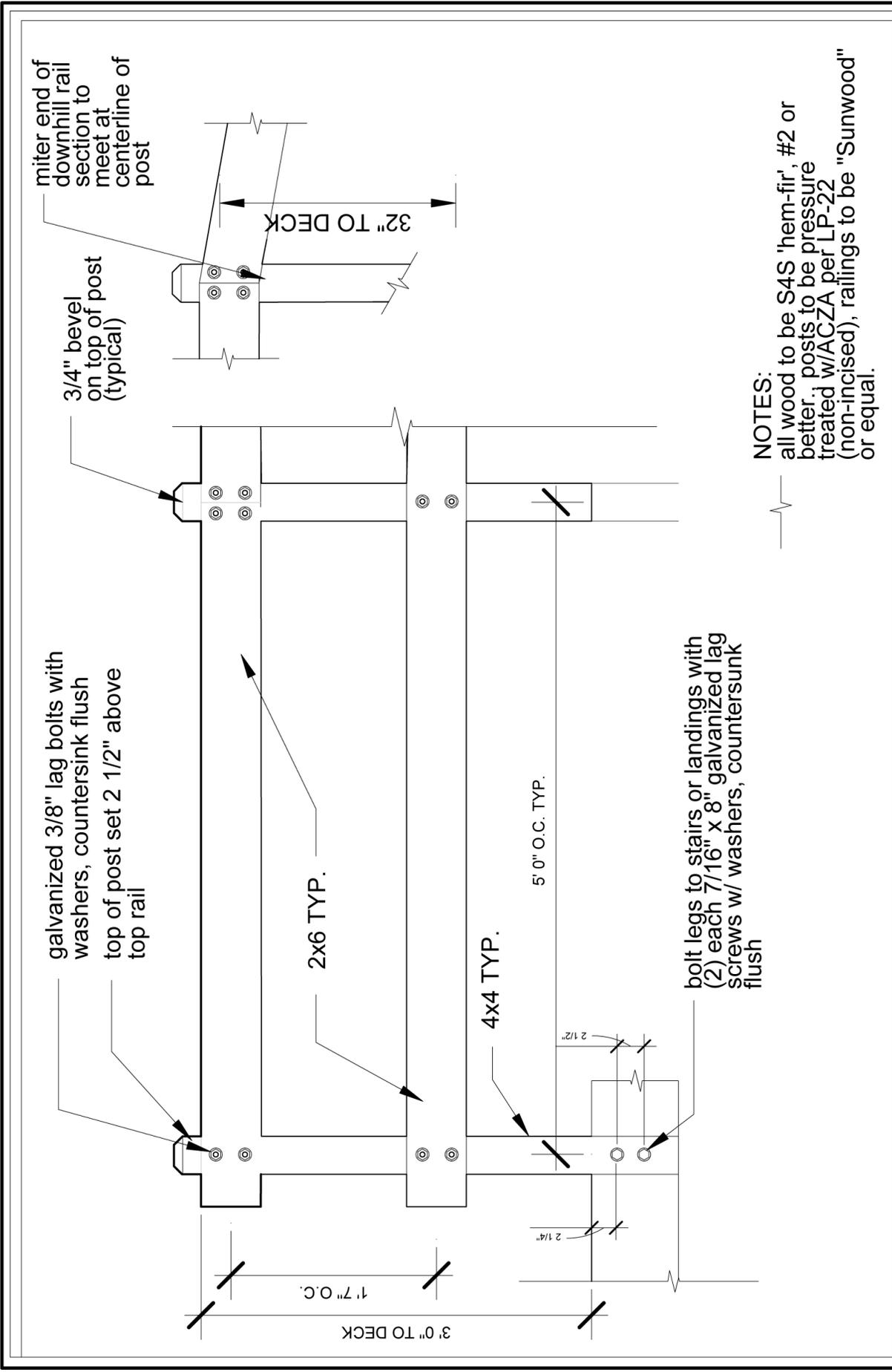
| | |
|----------------|--------------|
| DRAWING NUMBER | 73 |
| SCALE | 3/4" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |



1 SECTION

2 ELEVATION

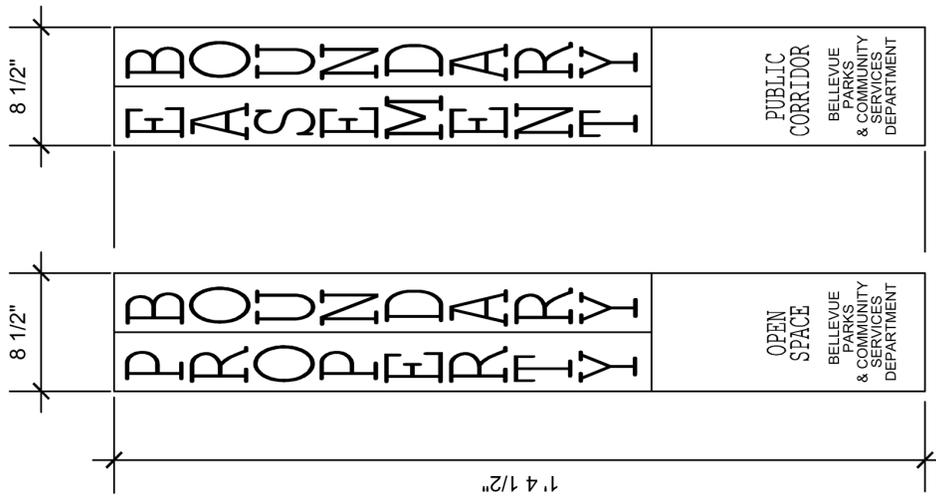
NOTES:
 diagonal brace rails (4x4) to be installed at all end sections, top of brace at top of end section/corner.
 all lumber shall be pressure-treated LP-22 or as approved by owner. fasten all materials w/ 12d galvanized common nails unless otherwise indicated.



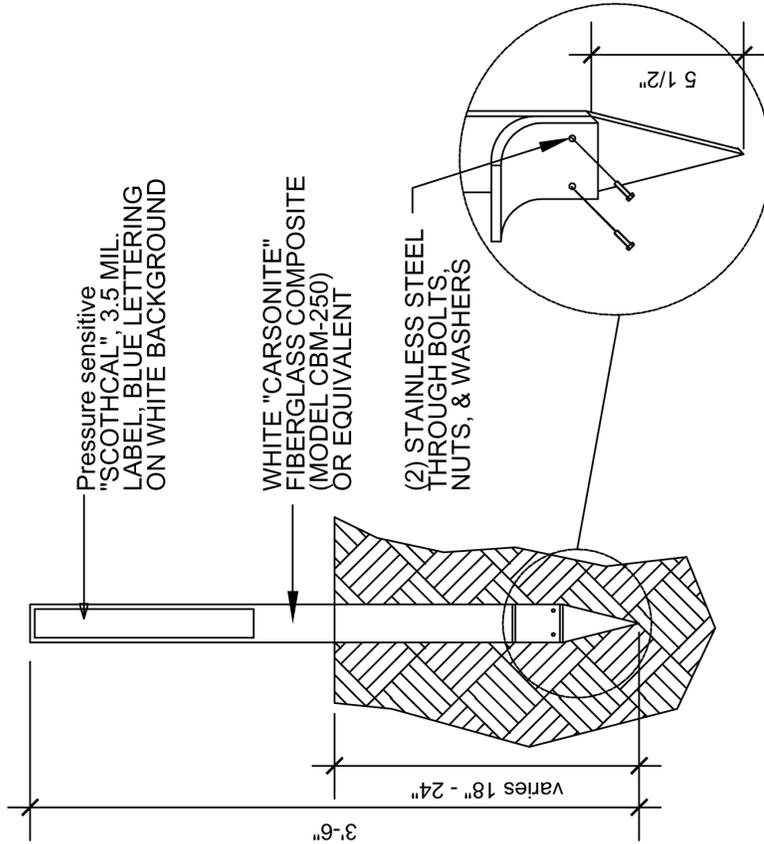
| | |
|----------------|------------|
| DRAWING NUMBER | 74 |
| SCALE | 1" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

TITLE: WOOD STAIR RAILING





SIGN FACES



City of
Bellevue

TITLE : BOUNDARY/EASEMENT SIGN

| | |
|----------------|------------|
| DRAWING NUMBER | 77 |
| SCALE | 1" = 1' 0" |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |

(3) 1/2" X 5 1/2" GALV. carriage bolts, nuts, & washers - countersink nut side 1" dia. X 1/2" deep - Space equally.

1' - 6" radius

City of Bellevue logo, arrow & letters to be white, machine-cut vinyl (3-M SCOTCHCAL #3470 or equal).

Letter style to be 1-1/2" high caps Helvetica Condensed for "CITY OF BELLEVUE" & 3" high caps "Palatino" for all other text.

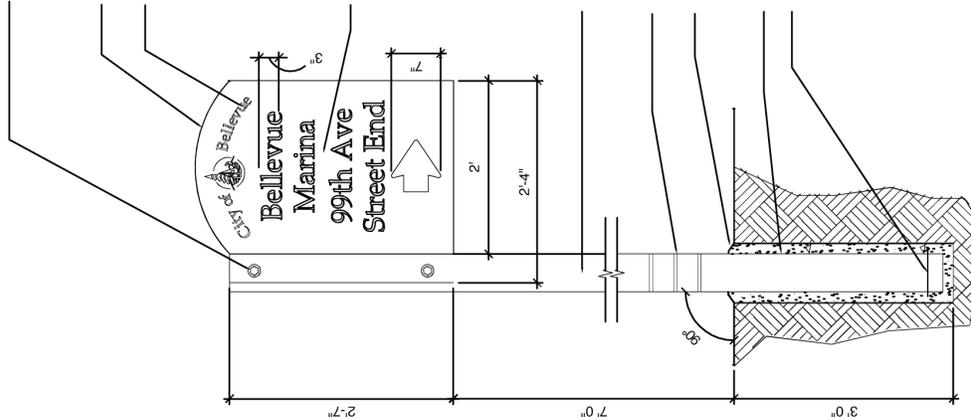
0.125 flat sheet aluminum background. Paint with epoxy enamel, semi-matte, blue (TNEMEC; "FJORD" #BA22 or color and performance equal). Sandwich sign in 1/8" groove cut down center of post.

6 X 6 pressure-treated Douglas Fir post painted OLYMPIC "CAPE COD GRAY", opaque (or color and performance equal).

(3) 1.75" Dia. holes drilled through post at 6" intervals.

Tool edges, 1/2" radius

12" dia. footing, 2500 psi concrete
1/2" x 10" steel rod through post

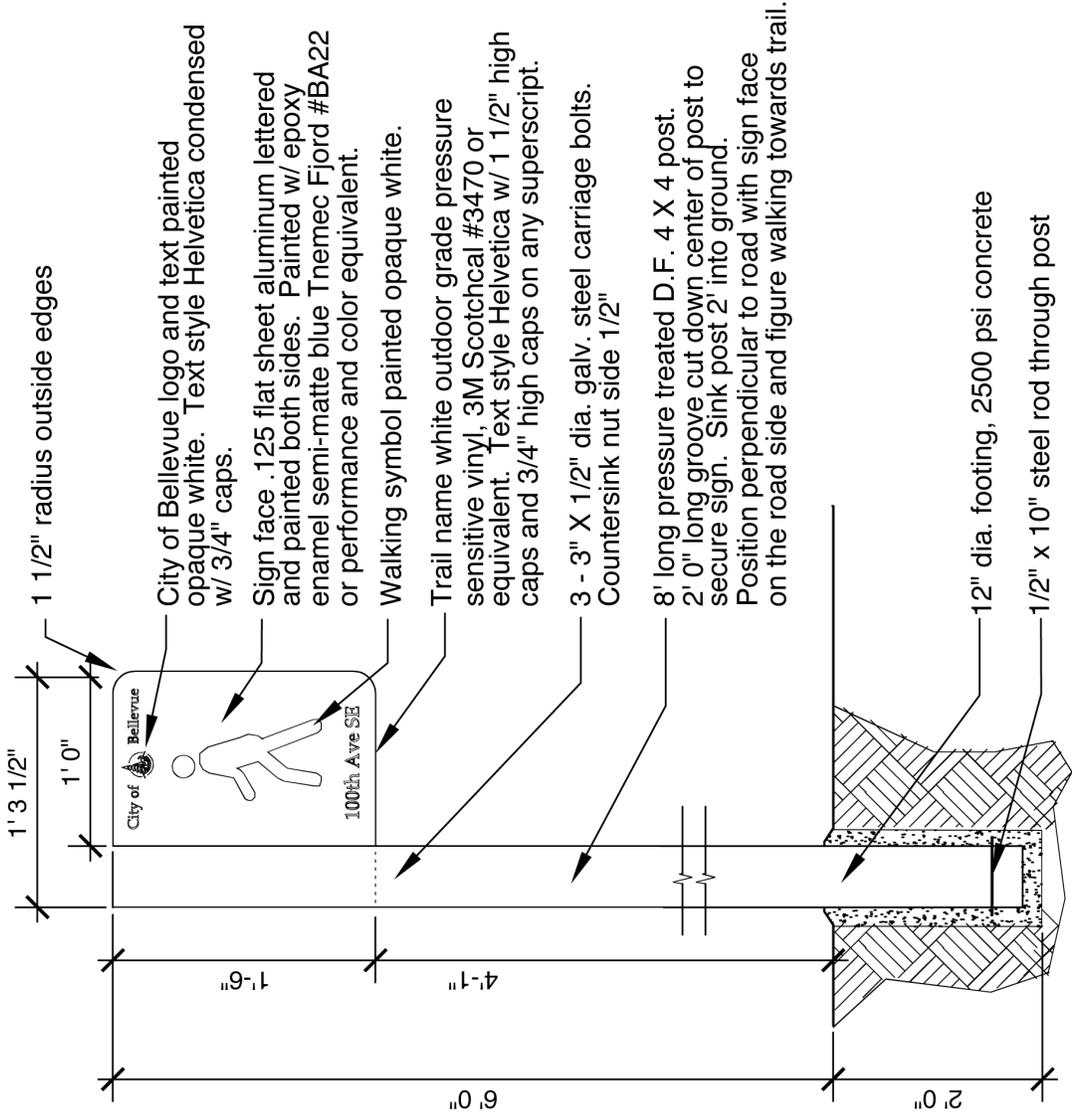


NOTES:
Sign face identical, both sides (except arrow).
Text as approved by Bellevue Parks & Community Services Department - text shown is for reference only.

| | |
|----------------|--------------|
| DRAWING NUMBER | 78 |
| SCALE | 1/2" = 1' 0" |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |

TYPICAL PRIMARY DIRECTIONAL SIGN





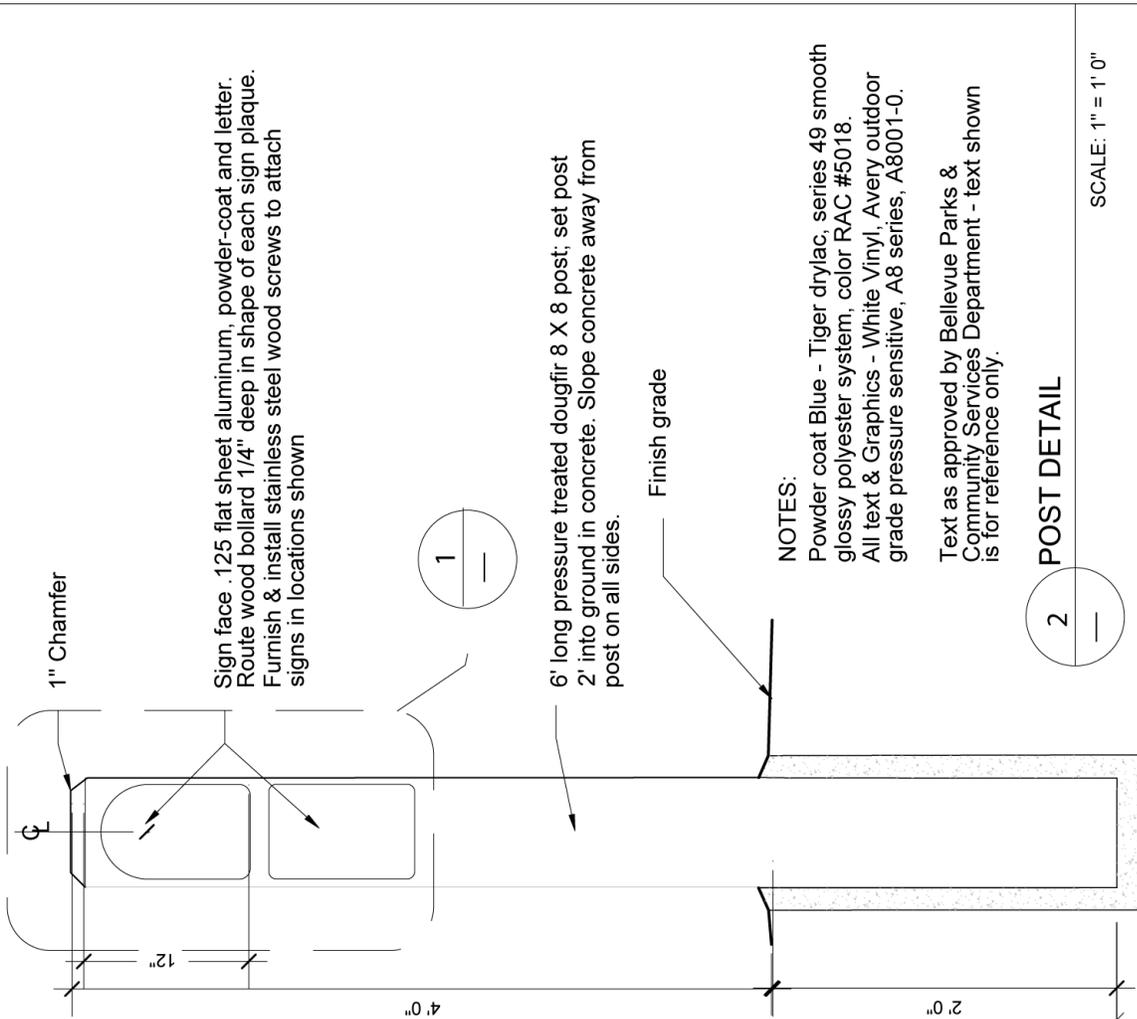
- 1' 3 1/2" radius outside edges
- City of Bellevue logo and text painted opaque white. Text style Helvetica condensed w/ 3/4" caps.
- Sign face .125 flat sheet aluminum lettered and painted both sides. Painted w/ epoxy enamel semi-matte blue Themec Fjord #BA22 or performance and color equivalent.
- Walking symbol painted opaque white.
- Trail name white outdoor grade pressure sensitive vinyl, 3M Scotchcal #3470 or equivalent. Text style Helvetica w/ 1 1/2" high caps and 3/4" high caps on any superscript.
- 3 - 3" X 1/2" dia. galv. steel carriage bolts. Countersink nut side 1/2"
- 8' long pressure treated D.F. 4 X 4 post. 2'0" long groove cut down center of post to secure sign. Sink post 2' into ground. Position perpendicular to road with sign face on the road side and figure walking towards trail.
- 12" dia. footing, 2500 psi concrete
- 1/2" x 10" steel rod through post

Note: Text as approved by Bellevue Parks & Community Services Department - text shown is for reference only.

| | |
|----------------|------------|
| DRAWING NUMBER | 79 |
| SCALE | 1" = 1' 0" |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |

TYPICAL DIRECTIONAL SIGN TITLE : FOR PEDESTRIAN PATH





Sign face .125 flat sheet aluminum, powder-coat and letter. Route wood bollard 1/4" deep in shape of each sign plaque. Furnish & install stainless steel wood screws to attach signs in locations shown

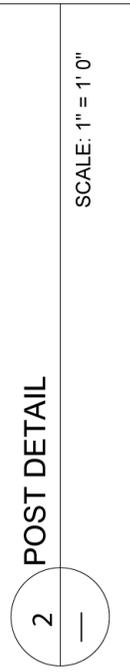
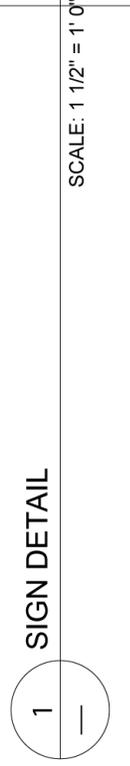
6' long pressure treated dougfir 8 X 8 post; set post 2' into ground in concrete. Slope concrete away from post on all sides.

Finish grade

NOTES:

Powder coat Blue - Tiger drylac, series 49 smooth glossy polyester system, color RAC #5018.
All text & Graphics - White Vinyl, Avery outdoor grade pressure sensitive, A8 series, A8001-0.

Text as approved by Bellevue Parks & Community Services Department - text shown is for reference only.



| | |
|----------------|----------|
| DRAWING NUMBER | PK-0080 |
| SCALE | AS SHOWN |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |

Sign - Directional Bollard





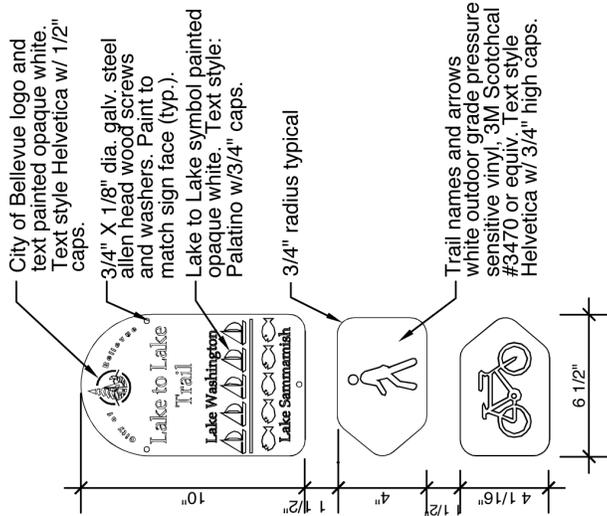
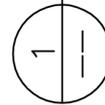
City of
Bellevue

**LAKE TO LAKE
DIRECTIONAL BOLLARD**

| | |
|----------------|----------|
| DRAWING NUMBER | 81 |
| SCALE | AS SHOWN |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |

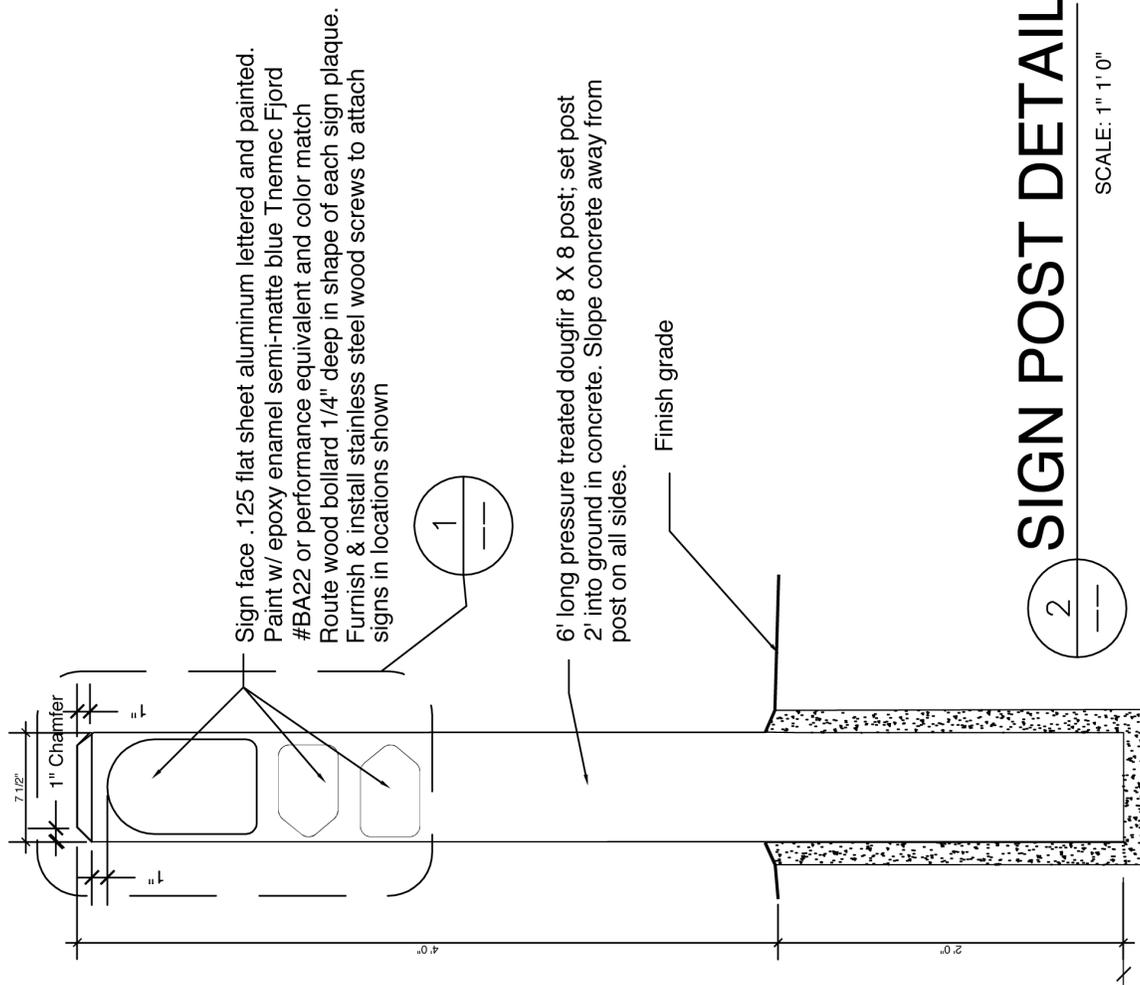
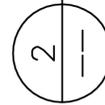
SIGN DETAIL

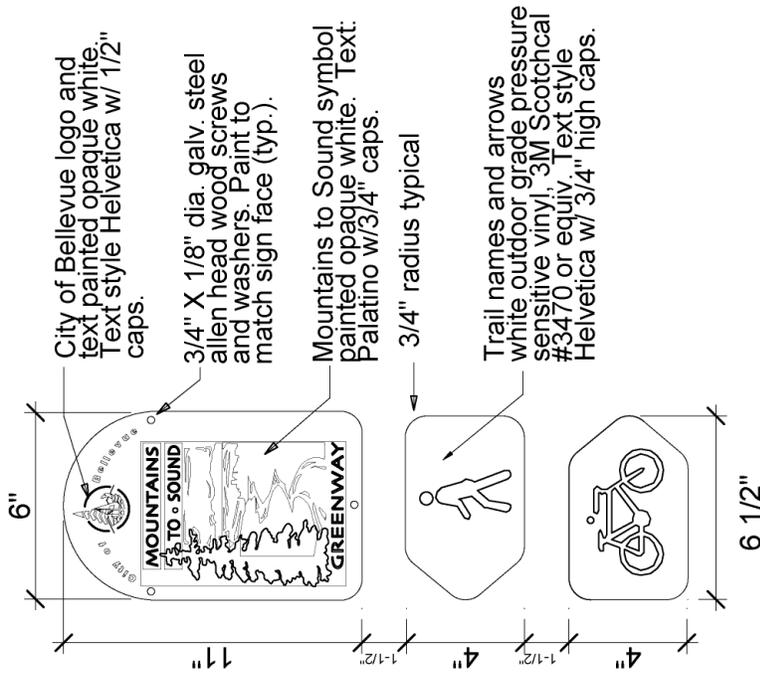
SCALE: 1 1/2" = 1' 0"



SIGN POST DETAIL

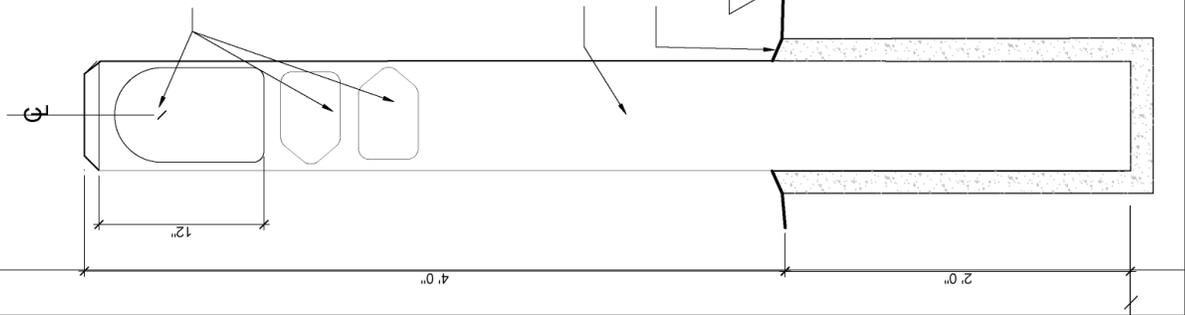
SCALE: 1" 1' 0"





Sign face . 125 flat sheet aluminum lettered and paint -
 Paint w/ epoxy enamel semi-matte blue Thernec Ford #BA22 or performance equivalent and color match -
 Route wood bollard 1/4" deep in shape of each sign plaque -
 Furnish & install stainless steel wood screws to attach signs in locations shown

6' long pressure treated dougfir 8 X 8 post
 Slope concrete away from post on all sides.
 Finish grade

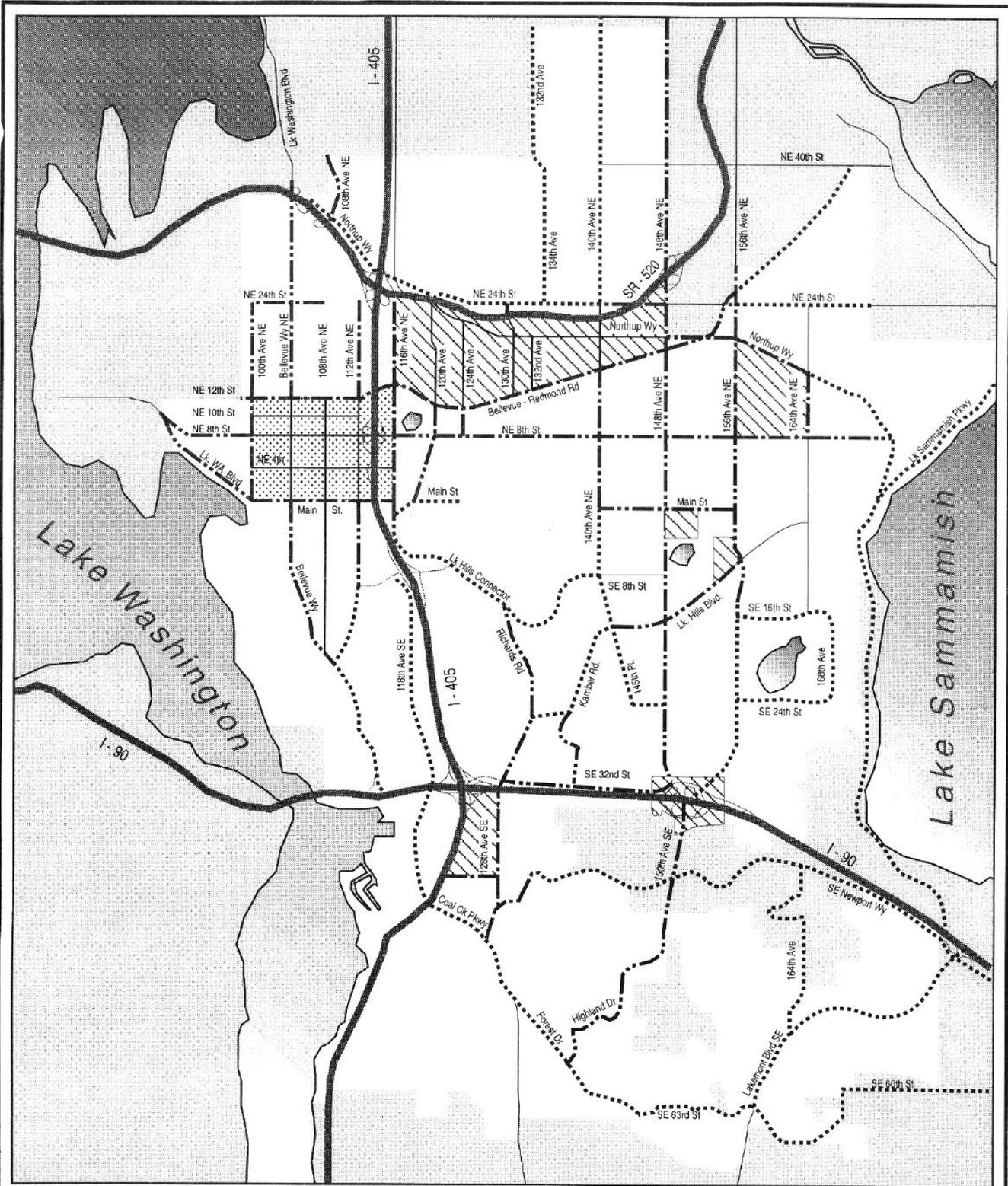


UPDATE NOTE:
 Insert signage matrI/color
 chart X-REF - Remove text w/i drwg

SIGN - DIRECTIONAL BOLLARD, MOUNTAINS TO SOUND

| | |
|----------------|--------------|
| DRAWING NUMBER | 82 |
| SCALE | 3/8" = 1' 0" |
| REVISION DATE | Draft |
| DEPARTMENT | PARKS |





 CATEGORY 1
DOWNTOWN

 CATEGORY 2
COMMERCIAL

 CATEGORY 3
BUFFER

 CATEGORY 4
BOULEVARD

 CATEGORY 5
NATURAL



City of
Bellevue

NO SCALE

STREET PLANTING CATEGORIES

REVISED: MARCH, 1996

APPENDIX D

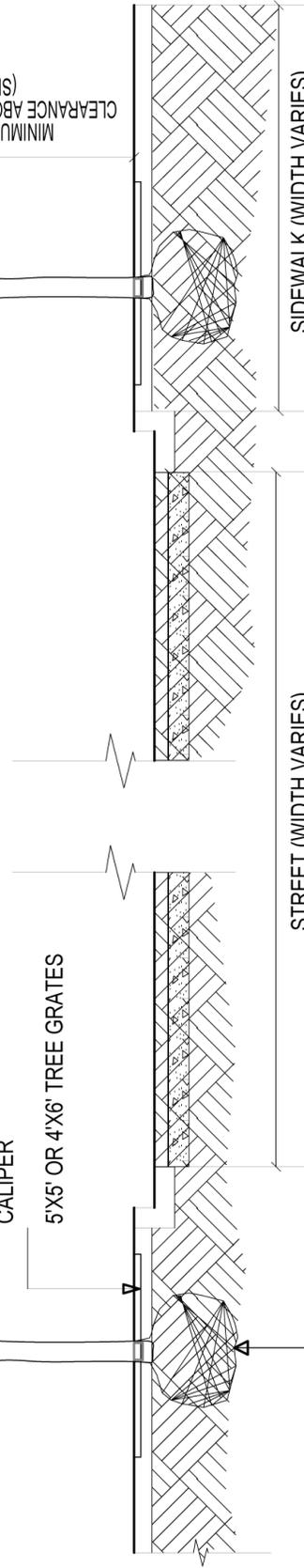


In Downtown Bellevue the street tree species selection shall conform to the Transportation Technical Manual Appendix 'E' Downtown Street Tree Species Plan, unless otherwise approved by the Director.

Requirements:
 see Land Use Code 20.25A.060

MINIMUM TREE SIZE: 3"
 CALIPER
 5'X5' OR 4'X6' TREE GRATES

MINIMUM TREE BRANCH
 CLEARANCE ABOVE SIDEWALK = 7'0"
 (SIDEWALK SIDE)



SEE TYPICAL TREE
 PLANTING DETAIL

City of Bellevue

NO SCALE

TITLE: STREET TREE DESIGN CONCEPTS
 CATEGORY ONE - DOWNTOWN.

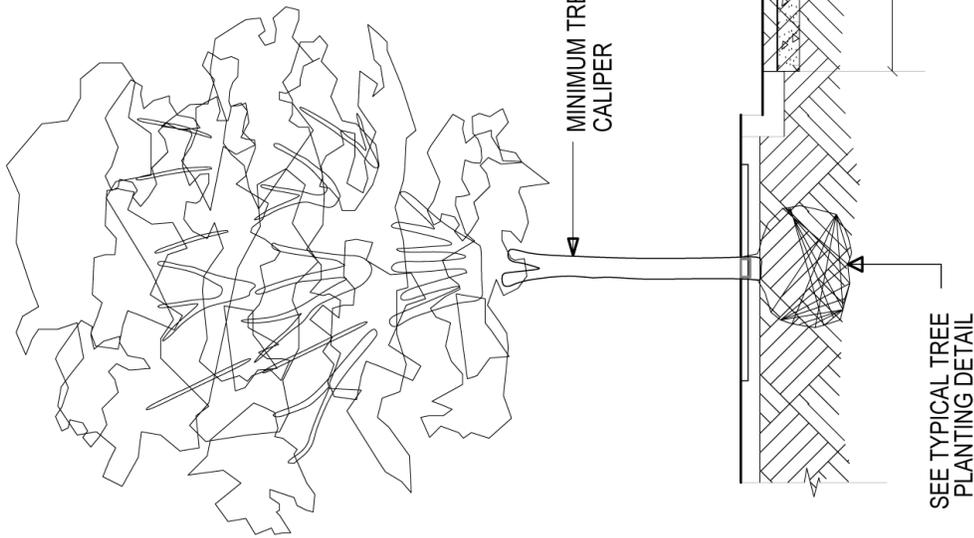
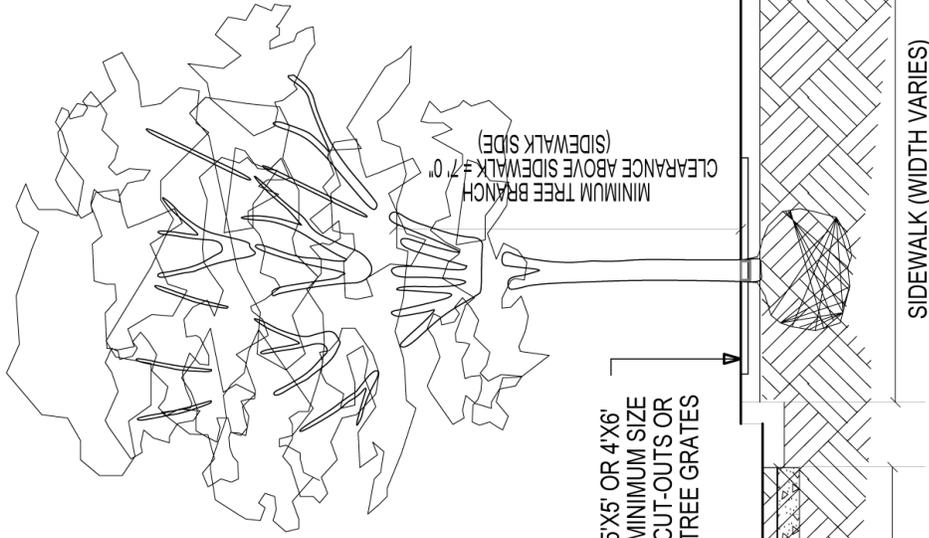
REVISED MARCH, 1996

NOTE:
 STREET FURNISHINGS ARE TO BE
 PROVIDED PER CITY GUIDELINES.

Purpose: Commercial areas of the City can be enhanced with tree planting to create spaces that are comfortably sized for human use. Because of the strong pedestrian orientation in these areas, trees are used to separate pedestrians from the street, and to provide human scale to the built environment. Trees in commercial areas are useful to define, create and reinforce space and corridors created by buildings and other features.

Requirements:

- † Regimented spacing, 30' O.C. max.
- † May include decorative paving
- † Minimum caliper size = 2 1/2"
- † May include accessible tree grates
- † Min. planter width 4", 4'x6" or 5'x5" min. area
- † Species per Appendix 'F' - City of Bellevue Designated Street Trees



City of Bellevue

NO SCALE

**STREET TREE DESIGN CONCEPTS
CATEGORY TWO - COMMERCIAL**

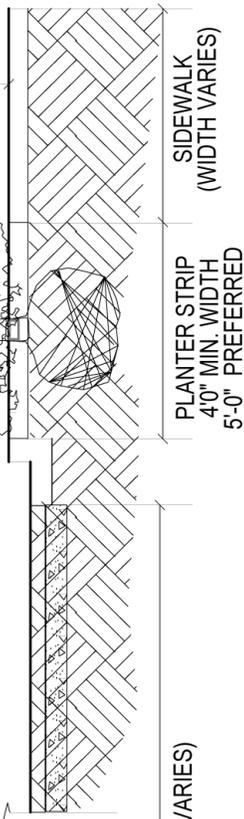
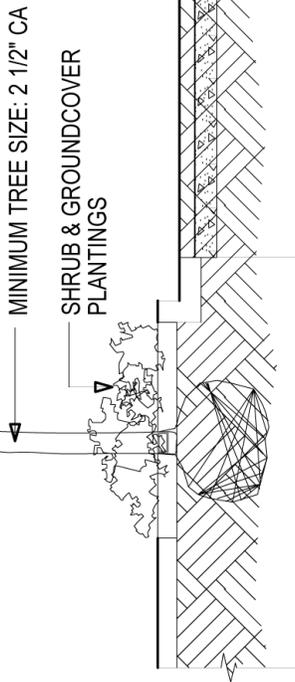
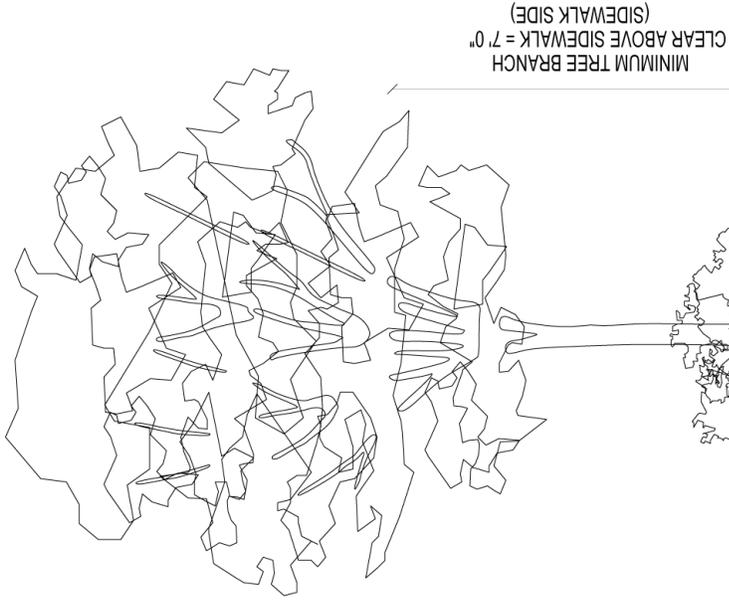
TITLE:

REVISED MARCH, 1996

Purpose: Where commercial areas meet residential land uses there is a need to provide significant neighborhood protection. This screening and buffering can be accomplished through the use of wide planter strips where possible. The design intent is to separate land uses. This can be accomplished by planting trees in a less regimented fashion. Varying tree spacings and appropriate use of shrubs and flowers can help make these areas distinctive.

Description:

- Minimum planting strip width is 4' (5' preferred)
- Planting strip located between sidewalk and curb
- Minimum tree size is 2 1/2" caliper
- Variations in tree spacing may be appropriate
- Species per Appendix F - City of Bellevue Designated Street Trees

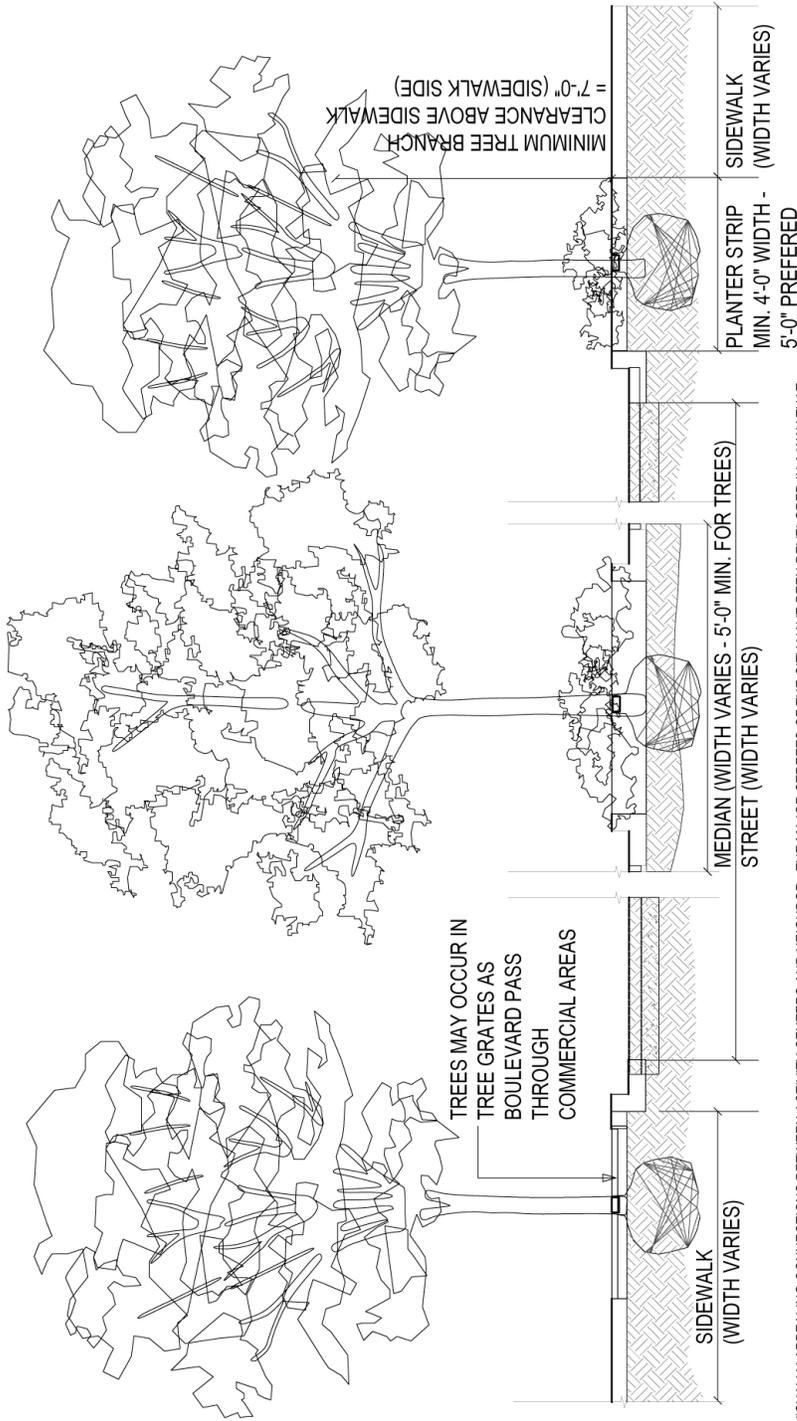


City of Bellevue

NO SCALE

TITLE: STREET TREE DESIGN CONCEPTS
CATEGORY THREE - BUFFER

REVISED MARCH, 1996



PURPOSE: TO CREATE VISUALLY APPEALING CONNECTIONS BETWEEN ACTIVITY CENTERS AND NEIGHBOR. THE MAJOR STREETS OF THE CITY HAVE BEEN DEVELOPED IN A WAY THAT EXEMPLIFIES THIS CONCEPT. THE USE OF LARGE TREES THAT PROVIDE CANOPY ENCLOSURE OVER THE STREET, MEDIANS, AND WIDE PLANTING STRIPS GIVES A PARKWAY APPEARANCE TO THESE STREETS.

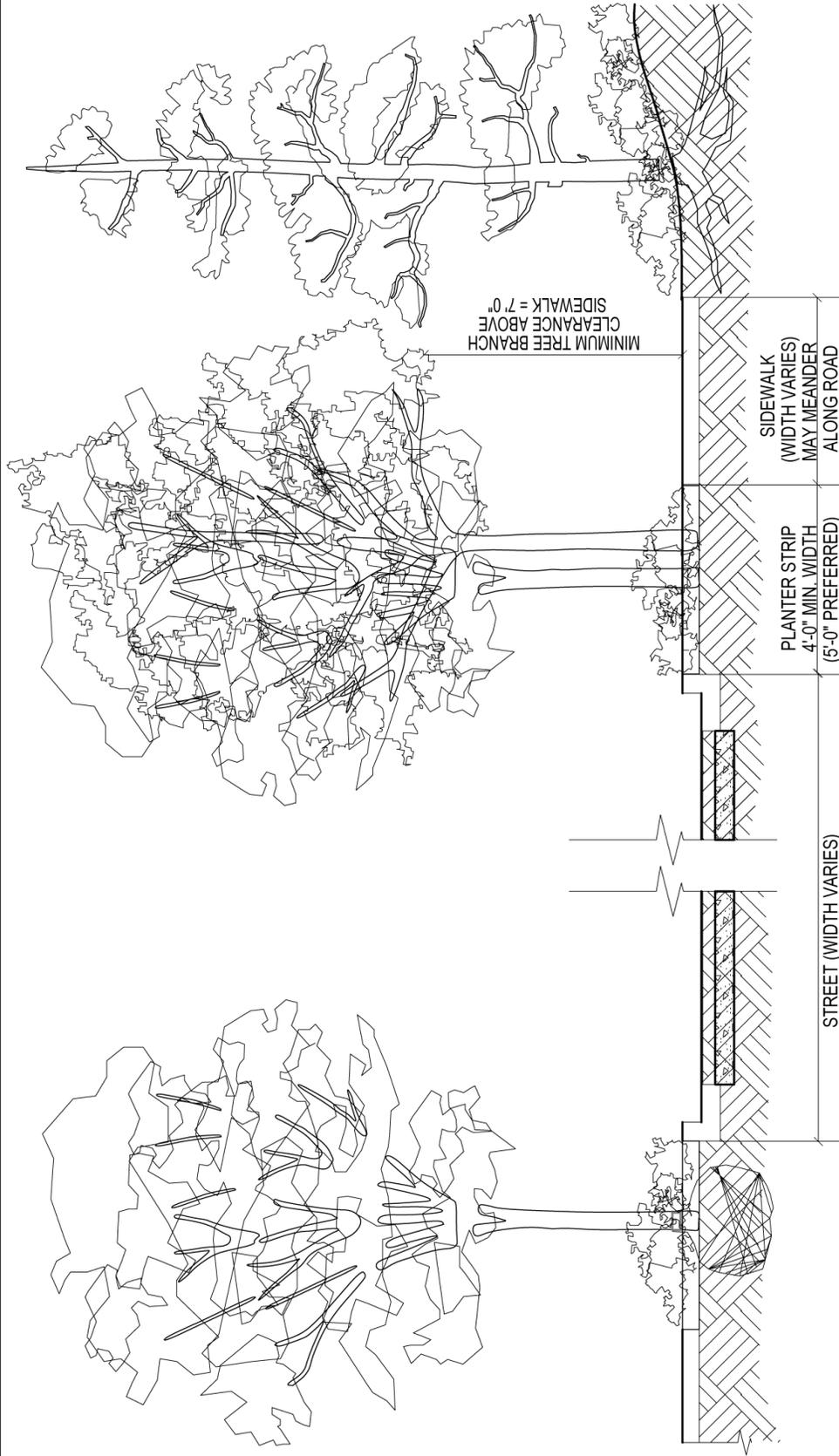
DESCRIPTION:

- * LARGE SCALE TREES
- * CHARACTERIZED BY MEDIANS AND PLANTING STRIPS
- * MIN TREE SIZE IS 2 1/2" CALIPER
- * PLANTINGS MAY INCLUDE A DESIGNATED TREE SPECIES PER APPENDIX 'F' - CITY OF BELLEVUE DESIGNATED STREET TREES
- * WHERE BOULEVARDS PASS THROUGH COMMERCIAL AREAS, STREET TREES MAY BE PLANTED IN REGIMENTED PLANTINGS WITHIN THE SIDEWALK OR IN PLANTING STRIPS, OR PLANTING PITS WITH TREE GRATES, CONSISTENT WITH OTHER CATEGORIES.

| | | | |
|---|--|----------------|------------|
| TITLE : STREET TREE DESIGN CONCEPTS CATEGORY FOUR - BOULEVARDS | | DRAWING NUMBER | X |
| | | SCALE | 1" = 1' 0" |
| | | REVISION DATE | 3/01 |
| | | DEPARTMENT | PARKS |



City of Bellevue



Purpose: Streets primarily vegetated by native plants retain the natural character associated with the Puget Sound region's native landscape. Examples of such streets are the Lake Hills Connector and Forest Drive S.E.

Description:

- i Use native or native-appearing trees and shrubs in informal plantings
- i Natural appearance preserved by retaining existing native trees and understory
- i Where space permits, wider planting areas can be created by the use of curvilinear pathways
- i Selection of plants should emphasize drought-tolerance, and low maintenance requirements

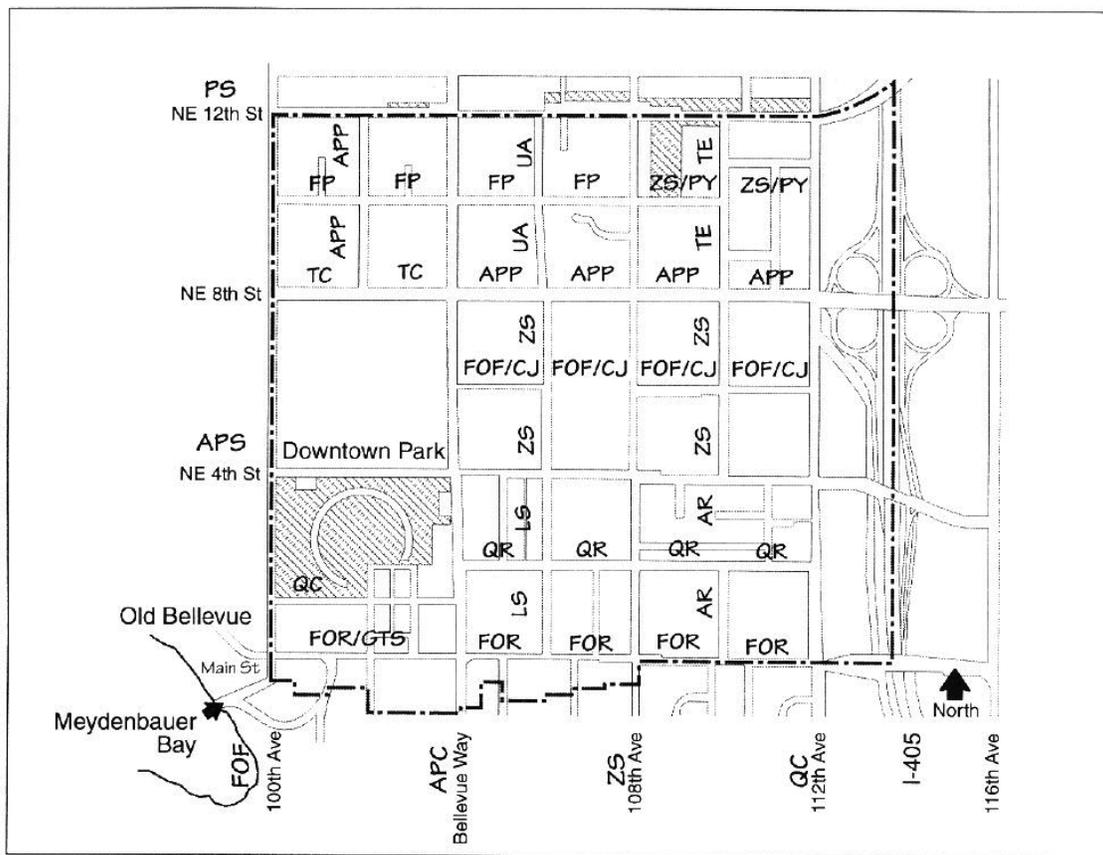
City of Bellevue

NO SCALE

TITLE: STREET TREE DESIGN CONCEPTS CATEGORY FIVE - NATURAL

TITLE:

REVISED MARCH, 1996



 Existing parkland

 CBD Boundary

Symbol Latin Name/Common Name

| | |
|-----|--|
| ACP | <i>Acer platanoides</i> 'Cleveland'/Cleveland Maple |
| APP | <i>Acer platanoides</i> 'Parkway'/Parkway Maple |
| APS | <i>Acer platanoides</i> 'Superform'/Superform Maple |
| AR | <i>Acer rubrum</i> /Red Maple |
| CJ | <i>Cercidiphyllum japonicum</i> /Katsura Tree |
| FOR | <i>Fraxinus ornus</i> 'Raywood'/Raywood Ash |
| FOF | <i>Fraxinus oxycarpa</i> 'Flame'/Flame Ash |
| FP | <i>Fraxinus pennsylvanica</i> 'Marshall'/Marshall Seedless Ash |
| GTI | <i>Gleditsia triacanthos inermis</i> /Thornless Honey Locust |
| GTS | <i>Gleditsia triacanthos</i> 'Skyline'/Skyline Honey Locust |
| LS | <i>Liquidambar styraciflua</i> /Sweet Gum |
| PS | <i>Prunus serrulata</i> 'Kwanzan'/Kwanzan Cherry |
| PY | <i>Prunus yedoensis</i> 'Akebono'/Akebono Cherry |
| PC | <i>Pyrus calleryana</i> 'Bradford'/Bradford Pear |
| QC | <i>Quercus coccinea</i> /Scarlet Oak |
| QR | <i>Quercus robur</i> /English Oak |
| TC | <i>Tilia cordata</i> /Little Leaf Linden |
| TE | <i>Tilia euchlora</i> 'Redmond'/Redmond Linden |
| UA | <i>Ulmus americana</i> 'Homestead'/Homestead Elm |
| ZS | <i>Zelkova serrata</i> /Zelkova |



City of
Bellevue

No Scale

DOWNTOWN BELLEVUE STREET TREE SPECIES PLAN

REVISED MARCH, 1996

APPENDIX E

City of Bellevue Designated Street Trees

| | |
|--|---|
| 100th Ave NE - Main St to NE 8th St | Fraxinus oxycarpa 'Flame' |
| 100th Ave NE - NE 8th St to NE 24th St | Pyrus calleryana 'Chanticleer' |
| 108th Ave SE - Main St to Bellevue Wy SE | Zelkova serrata 'Village Green' |
| 108th Ave NE - Northup Wy to NE 40th St | Quercus palustris |
| 108th Ave NE - Main St to NE 12th St | Zelkova serrata 'Village Green' |
| 112th Ave NE - NE 12th St to NE 24th St | Quercus coccinea |
| 112th Ave SE - SE 2nd St to Bellevue Wy SE | Native trees: Betula papyrifera/Crataegus phaenopyrum/ Pseudotsuga menziesii |
| 116th Ave NE - NE 8th St to NE 12th St | Platanus x acerifolia 'Bloodgood'/ |
| 116th Ave NE - SE 1st St to NE 8th St | Gleditsia triacanthos inermis |
| 118th Ave SE - SE 8th St to SE 40th St | Native trees |
| 119th Ave SE - Coal Creek Pkwy to SE 60th St | Liquidambar styraciflua |
| 120th Ave NE - Main St to NE 20th St | Quercus rubra |
| 124th Ave NE - NE 8th St to Northup Wy | Crataegus mollis |
| 128th Ave NE - SE 38th St to Coal Creek Pkwy | Acer rubrum |
| 130th Ave NE - Bel-Red Rd to Northup Wy | Acer rubrum |
| 132nd Ave NE - Bel-Red Rd to Northup Wy | Quercus robur |
| 139th Ave SE - SE Eastgate Wy to Kamber Rd | Liriodendron tulipifera/Malus sp./Platanus x acerifolia |
| 140th Ave NE/SE - SE 8th St to Bel-Red Rd | Acer platanoides 'Emerald Queen' |
| 140th Ave NE - Bel-Red Rd to NE 24th St | Ginkgo biloba/Amelanchier sp. |
| 145Th Pl SE - SE 8th St to SE 24th St | Native trees |
| 148th Ave NE/SE - NE 40th St to SE Eastgate Wy | Platanus x acerifolia/Pseudotsuga menziesii |
| 156th Ave NE - NE 8th St to Bel-Red Rd | Quercus coccinea |
| 156th Ave NE - Bel-Red Rd to NE 24th St | Acer x freemani 'Armstrong' |
| 156th Ave SE - SE 24th St to SE Eastgate Wy | Quercus rubra |
| 156th Ave SE - SE 24th St to SE 16th St | Populus tremuloides |
| 164th Ave NE - NE 8th St to NE 24th St | Acer platanoides |
| 164th Ave SE - SE 46th Wy to Lakemont Blvd SE | Fraxinus pennsylvanica/Pseudotsuga menziesii |
| 168th Ave SE - SE 14th St to SE 24th St | Fraxinus oxycarpa 'Raywood' |
| Bel-Red Road - 124th Ave NE to City limits | Platanus x acerifolia/Quercus palustris |
| Bellevue Way NE - NE 12th St to SR-520 | Acer platanoides 'Cleveland'/Acer campestre |

| | |
|--|--|
| Bellevue Way SE - Main St to 112th Ave SE | Acer platanoides 'Crimson King'/Quercus palustris |
| Bellevue Way SE - 112th Ave SE to I-90 | Fraxinus pennsylvanica 'Summit'/native trees |
| Coal Creek Parkway - I-405 to 128th Ave SE | Acer platanoides 'Olmstead' |
| Forest Drive SE - Coal Creek to Lakemont Blvd SE | Native trees/Betula jacquemontii/Fagus sylvatica/Thuja plicata |
| Highland Drive - SE Newport Way to Forest Dr SE | Acer ginnala/Acer platanoides/Prunus serrulata 'Kwanzan' |
| Kamber Road - Richards Rd to 145th PI SE | Native trees/Crataegus phaenopyrum |
| Lakemont Blvd SE - 164th SE to Coal Creek Pkwy | Native trees/Fraxinus pennsylvanica 'Marshall Seedless' |
| Lakemont Blvd SE - I-90 to 164th Ave SE | Acer platanoides/Thuja plicata/Pseudotsuga menziesii |
| Lake Hills Blvd | Betula pendula |
| Main Street - 100th Ave to Bellevue Way | Fraxinus oxycarpa 'Raywood'/Gleditsia triacanthos inermis |
| Main Street - 112th Ave to 116th Ave | Fraxinus oxycarpa 'Raywood' |
| Main Street - 140th Ave to 156th Ave | Gleditsia triacanthos inermis/Carpinus betulus 'Columnaris' |
| NE 8th St - 92nd Ave NE to 100th Ave NE | Carpinus betulus 'Columnaris' |
| NE 8th St - 116th Ave NE to 164th Ave NE | Pyrus calleryana 'Aristocrat'/Platanus x acerifolia |
| NE 12th St - 100th Ave NE to 124th Ave NE | Prunus serrulata 'Kwanzan'/Tilia americana |
| NE 24th St - 98th Ave NE to Bellevue Wy NE | Cercis canadensis |
| NE 24th St - 140th Ave NE to 148th Ave NE | Acer platanoides/Prunus serrulata 'Kwanzan'/Pseudotsuga menziesii |
| NE 24th St - 156th Ave NE to 170th Ave NE | Prunus serrulata 'Kwanzan' |
| Northup Way - 124th Ave NE to 130th Ave NE | Acer platanoides 'Emerald Queen' |
| Northup Way - 130th Ave NE to 156th Ave NE | Acer rubrum 'Red Sunset' |
| Richards Road - I-90 to Lake Hills Connector | Acer rubrum/ Native trees |
| SE 16th St - 156th Ave SE to 160th Ave SE | Pyrus calleryana |
| SE 24th St - 156th Ave SE to 168th Ave SE | Pyrus calleryana/Sorbus aucuparia |
| SE 38th St - I-90 to 156th Ave SE | Quercus coccinea/Pseudotsuga menziesii/Acer platanoides 'Emerald Queen'/Malus floribunda 'Snowdrift' |
| SE 60th St - Lake Wa. Blvd to 129th Ave SE | Tilia cordata/Malus floribunda 'Snowdrift' |
| SE 60th St - 129th Ave SE to Coal Creek Pkwy | Native trees/Amelanchier alnifolia |
| SE 63rd St - Lakemont Blvd SE to Forest Drive SE | Native trees |
| SE Cougar Mt. Way - Lakemont Blvd to 168th PI | Native trees |
| SE Eastgate Way - Richards Rd to SE 35th PI | Quercus coccinea/Pseudotsuga menziesii/Acer platanoides 'Emerald Queen' |
| SE Phantom Way - 160th to 168th | Pyrus calleryana |
| Village Park Drive SE - Lakemont Blvd SE to City limit | Native trees |
| West Lake Sammamish Pkwy - City limits | Native trees |

Approved Street Trees

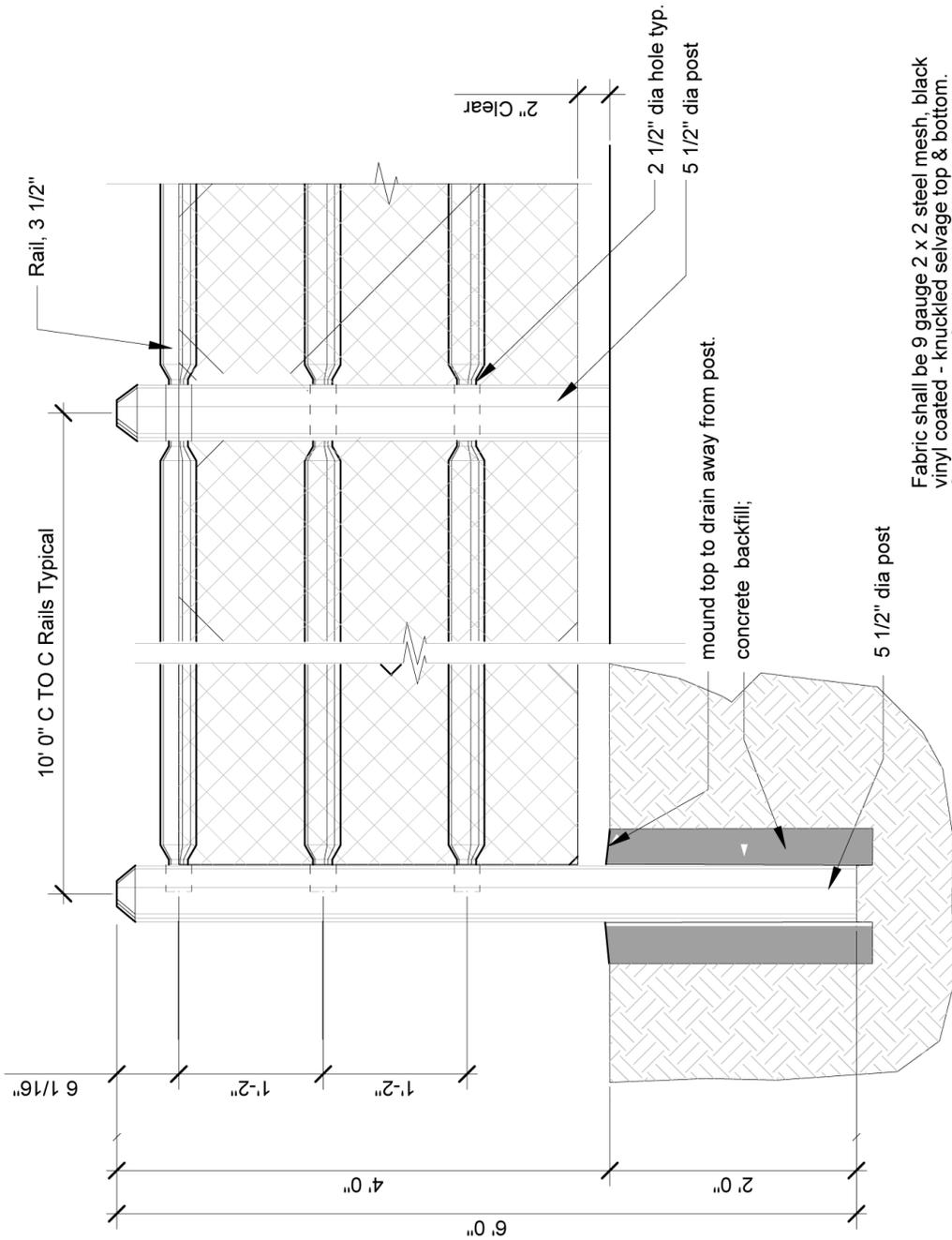
| Small-sized trees (30' or less) | | * Many varieties are available, check with Parks Department for suitability | | | | | | | | | | | | | Remarks | | | | | |
|----------------------------------|-----------------------------|---|---------------------------|---------------------------|----------------------------|--------------------------|--------------------------|--------------------------|---------------------------|-----------------|------------------|------------------|-----------------|------------------|---------|--------------------|------------------|----------------------|------------------|---|
| Latin Names | Common Names | 4 feet min. planter width | 5 feet min. planter width | 8 feet min. planter width | 10 feet min. planter width | 4 feet min. dia. planter | 6 feet min. dia. planter | 8 feet min. dia. planter | 10 feet min. dia. planter | 10 - 20' spread | 20' - 30' spread | 30' - 40' spread | Over 40' spread | Slow growth rate | | Medium growth rate | Fast growth rate | Sunshade requirement | Drought tolerant | Tolerates poor drainage |
| Acer buergerianum | Trident Maple | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | low, spreading tree, mixed fall color |
| Acer campestre 'Queen Elizabeth' | Queen Elizabeth Hedge Maple | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | rounded head, glossy foliage |
| Acer griseum | Paperbark Maple | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ● | ✓ | ✓ | peeling bark, compound leaves |
| Acer platanoides 'Globosum' | Globe Norway Maple | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | slow growing, dense-round crown |
| Acer tataricum | Tatarian Maple | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | extremely hardy, red seeds, showy fall color |
| Amelanchier spp.* | Serviceberry | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | showy, short-lived flower clusters, showy fruit |
| Carpinus caroliniana | American Hornbeam | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | round canopy, yellow/red fall color |
| Catalpa bignonioides | Common Catalpa | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | 5 - 8 inch-long leaves |
| Cercis canadensis | Eastern Redbud | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | horizontal branching, red petioles |
| Cornus kousa | Korean Dogwood | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ● | ✓ | ✓ | delicate, upright branching, white flowers |
| Cornus nuttallii | Pacific Dogwood | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ● | ✓ | ✓ | disease-prone native, open habit |
| Crataegus crus-galli 'Inermis' | Cockspur Hawthorn | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | smooth, glossy foliage, white flowers |
| Crataegus laevalei | Lavalle Hawthorn | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | glossy foliage, orange fruit, smooth bark |
| Crataegus mollis | Downy Hawthorn | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | smooth, glossy foliage, white flowers |
| Crataegus viridis 'Winter King' | Winter King Green Hawthorn | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | wide, broad-spreading crown |
| Crataegus phaenopyrum | Washington Hawthorn | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | glossy leaves, white flowers, red fruit |
| Fraxinus oxycarpa | Raywood Ash | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | seedless, reddish fall color |
| Malus species & hybrids* | Crabapple | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | pinkish red flowers, dark red fruit |
| Magnolia stellata | Star Magnolia | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | shrubby tree, fine texture, white flowers |
| Prunus cerasifera | Thundercloud Plum | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | dark purple foliage |
| Prunus sargentii 'Accolade' | Accolade Sargent Cherry | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | pink flowers, upright form |
| Prunus serrulata 'Amanogawa' | Amanogawa Cherry | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | very columnar, light pink flowers |
| Prunus serrulata 'Kwanzan' | Kwanzan Cherry | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | branches stiffly upright, rozy pink flowers |
| Sorbus aucuparia | European Mountain Ash | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | compound leaves, showy orange berries |
| Syringa reticulata 'Regent' | Regent Japanese Lilac | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ | ✓ | showy white flowers |

Approved Street Trees

| Medium-sized trees (30' to 50') | | * Many varieties are available, check with Parks Department for suitability | | | | | | | | | | | | Remarks | | | | | | |
|---|------------------------------|---|---------------------------|---------------------------|----------------------------|--------------------------|--------------------------|--------------------------|---------------------------|------------------|------------------|------------------|-----------------|---------|------------------|--------------------|------------------|-----------------------|------------------|--|
| Latin Names | Common Names | 4 feet min. planter width | 5 feet min. planter width | 8 feet min. planter width | 10 feet min. planter width | 4 feet min. dia. planter | 6 feet min. dia. planter | 8 feet min. dia. planter | 10 feet min. dia. planter | 10' - 20' spread | 20' - 30' spread | 30' - 40' spread | Over 40' spread | | Slow growth rate | Medium growth rate | Fast growth rate | Sun/shade requirement | Drought tolerant | Tolerates poor drainage |
| <i>Acer platanoides*</i> | Norway Maple | | | | | | | | | | | | | | | | | | | med. to med. large shade trees |
| <i>Acer pseudoplatanum</i> | Sycamore Maple | | | | | | | | | | | | | | | | | | | similar to Platanus |
| <i>Acer rubrum*</i> | Red Maple | | | | | | | | | | | | | | | | | | | scarlet fall color, ('Armstrong' var. spire-like) |
| <i>Aesculus x carnea 'Brutti'</i> | Red Flowering Horsechestnut | | | | | | | | | | | | | | | | | | | rosy-crimson flowers |
| <i>Betula jacquemontii</i> | Jacquemontii Birch | | | | | | | | | | | | | | | | | | | tall, narrow, brilliant white bark |
| <i>Betula nigra 'Heritage'</i> | Heritage River Birch | | | | | | | | | | | | | | | | | | | upright form, tan, shiny bark |
| <i>Betula papyrifera</i> | Paper Birch | | | | | | | | | | | | | | | | | | | classic white peeling bark, yellow fall color |
| <i>Betula pendula</i> | European White Birch | | | | | | | | | | | | | | | | | | | open habit, white bark, delicate lacy foliage |
| <i>Carpinus betulus 'Fastigiata'</i> | Pyramidal European Hornbeam | | | | | | | | | | | | | | | | | | | dense, clean foliage, pyramidal in form |
| <i>Cladrastis lutea</i> | Yellowwood Tree | | | | | | | | | | | | | | | | | | | broad, round head, fragrant flowers |
| <i>Catalpa speciosa</i> | Western Catalpa | | | | | | | | | | | | | | | | | | | needs pruning to attain proper street tree form |
| <i>Celtis laevigata 'All Seasons'</i> | All Seasons Sugar Hackberry | | | | | | | | | | | | | | | | | | | open shade tree |
| <i>Celtis occidentalis</i> | Common Hackberry | | | | | | | | | | | | | | | | | | | broad, open canopy |
| <i>Cercidiphyllum japonicum</i> | Katsura Tree | | | | | | | | | | | | | | | | | | | soft textured spreading shade tree |
| <i>Corylus colurna</i> | Turkish Filbert | | | | | | | | | | | | | | | | | | | upright form, pest free, corky bark |
| <i>Fraxinus p. 'Marshall Seedless'</i> | Marshall Seedless Ash | | | | | | | | | | | | | | | | | | | compact oval crown, seedless, glossy leaves |
| <i>Ginkgo biloba* (males only)</i> | Maidenhair Tree | | | | | | | | | | | | | | | | | | | yellow fall color |
| <i>Gleditsia triacanthos*</i> | Honeylocust | | | | | | | | | | | | | | | | | | | spreading, horizontal branching |
| <i>Koelreuteria paniculata</i> | Goldenrain Tree | | | | | | | | | | | | | | | | | | | large compound leaves, notable flowers |
| <i>Magnolia grandiflora</i> | Victoria Magnolia | | | | | | | | | | | | | | | | | | | evergreen foliage, white flowers |
| <i>Prunus sargentii 'Columnar'</i> | Columnar Sargent Cherry | | | | | | | | | | | | | | | | | | | more narrow and erect than species |
| <i>Pyrus betulifolia</i> | Ornamental Birchleaf Pear | | | | | | | | | | | | | | | | | | | erect, narrow tree w/ arching branches |
| <i>Pyrus calleryana*</i> | Gallery Pear | | | | | | | | | | | | | | | | | | | bright red fall color, 'Aristocrat' var. pyramidal |
| <i>Sophora japonica 'Regent'</i> | Regent Japanese Pagoda Tree | | | | | | | | | | | | | | | | | | | young wood smooth, dk. green, vigorous |
| <i>Tilia cordata*</i> | Little-leaf Linden | | | | | | | | | | | | | | | | | | | dense pyramidal form, flowers in July |
| <i>Tilia tomentosa 'Green Mountain'</i> | Green Mountain Silver Linden | | | | | | | | | | | | | | | | | | | good shade tree, tolerant of severe conditions |
| <i>Zelkova serrata*</i> | Zelkova | | | | | | | | | | | | | | | | | | | rough-textured shade tree, smooth grey bark |

Approved Street Trees

| Large-sized trees (50' or larger) | | * Many varieties are available, check with Parks Department for suitability | | | | | | | | | | | | | Remarks | | | | | |
|--|-------------------------|---|---------------------------|---------------------------|----------------------------|--------------------------|--------------------------|--------------------------|---------------------------|------------------|------------------|------------------|-----------------|------------------|---------|--------------------|------------------|-----------------------|------------------|---|
| Latin Names | Common Names | 4 feet min. planter width | 5 feet min. planter width | 8 feet min. planter width | 10 feet min. planter width | 4 feet min. dia. planter | 6 feet min. dia. planter | 8 feet min. dia. planter | 10 feet min. dia. planter | 10' - 20' spread | 20' - 30' spread | 30' - 40' spread | Over 40' spread | Slow growth rate | | Medium growth rate | Fast growth rate | Sun/shade requirement | Drought tolerant | Tolerates poor drainage |
| <i>Abies grandis</i> | Grand Fir | | | | | | | | | | | | | | | | | | | pyramidal evergreen to 150 feet tall |
| <i>Acer macrophyllum</i> | Big Leaf Maple | | | | | | | | | | | | | | | | | | | very adaptable, vigorous native |
| <i>Acer nigrum</i> 'Greencolumn' | Greencolumn Black Maple | | | | | | | | | | | | | | | | | | | resistant to heat & drought, columnar form |
| <i>Acer platanoides</i> 'Cleveland' | Cleveland Norway Maple | | | | | | | | | | | | | | | | | | | shapely, compact, well-formed trees |
| <i>Calocedrus decurrens</i> | Incense Cedar | | | | | | | | | | | | | | | | | | | evergreen symmetrical tree, fragrant |
| <i>Corylus colurna</i> | Turkish Filbert | | | | | | | | | | | | | | | | | | | cold hardy, edible fruit |
| <i>Fagus sylvatica</i> * | Green Beech | | | | | | | | | | | | | | | | | | | smooth bark, plant true species only on street |
| <i>Fraxinus americana</i> * | American Ash | | | | | | | | | | | | | | | | | | | seedless, purplish fall color |
| <i>Liquidambar styraciflua</i> * | American Sweetgum | | | | | | | | | | | | | | | | | | | clean, good winter form |
| <i>Liriodendron tulipifera</i> | Tulip Tree | | | | | | | | | | | | | | | | | | | dense pyramidal crown |
| <i>Metasequoia glyptostroboides</i> | Dawn Redwood | | | | | | | | | | | | | | | | | | | deciduous conifer |
| <i>Nyssa sylvatica</i> | Black Tupelo | | | | | | | | | | | | | | | | | | | glossy green leaves turn to dk. red in fall |
| <i>Platanus acerifolia</i> 'Bloodgood' | Bloodgood Plane Tree | | | | | | | | | | | | | | | | | | | hardy, fast growing shade tree, exfoliating bark |
| <i>Pseudotsuga menziesii</i> | Douglas Fir | | | | | | | | | | | | | | | | | | | native evergreen, hardy |
| <i>Quercus bicolor</i> | White Swamp Oak | | | | | | | | | | | | | | | | | | | large shiny leaves, silvery underneath |
| <i>Quercus coccinea</i> | Scarlet Oak | | | | | | | | | | | | | | | | | | | light open branching, bright red fall color |
| <i>Quercus macrocarpa</i> | Bur Oak | | | | | | | | | | | | | | | | | | | large acorns |
| <i>Quercus palustris</i> | Pin Oak | | | | | | | | | | | | | | | | | | | dead leaves persist through winter |
| <i>Quercus phellos</i> | Willow Oak | | | | | | | | | | | | | | | | | | | spreading habit, willow-like leaves |
| <i>Quercus robur</i> 'Fastigiata' | Fastigiata English Oak | | | | | | | | | | | | | | | | | | | narrow and upright |
| <i>Quercus rubra</i> | Northern Red Oak | | | | | | | | | | | | | | | | | | | broad spreading, orange fall color |
| <i>Quercus shumardii</i> | Shumard Oak | | | | | | | | | | | | | | | | | | | similar to scarlet oak, tolerates poor conditions |
| <i>Tilia americana</i> 'Redmond' | Redmond American Linden | | | | | | | | | | | | | | | | | | | pyramidal form with glossy foliage |

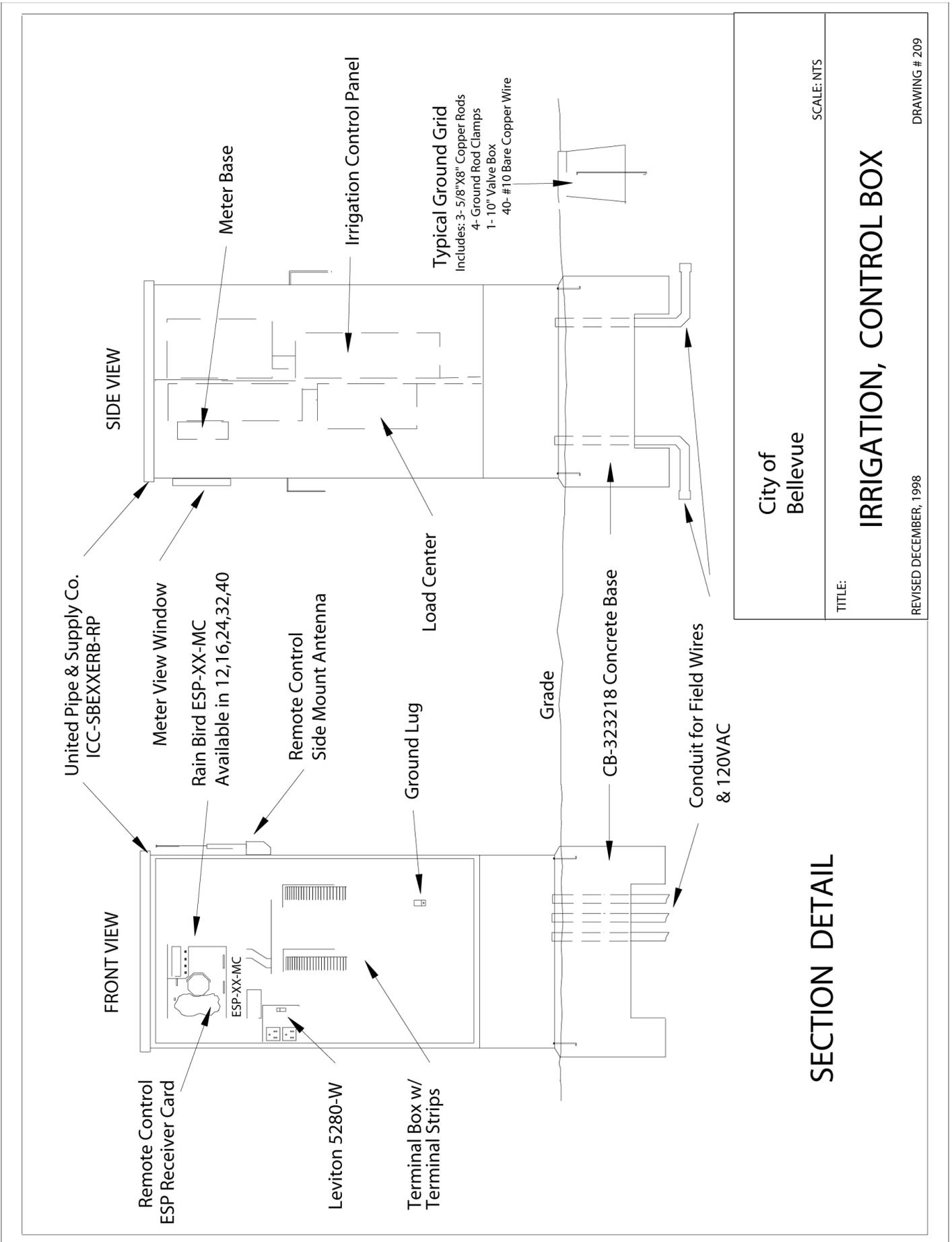


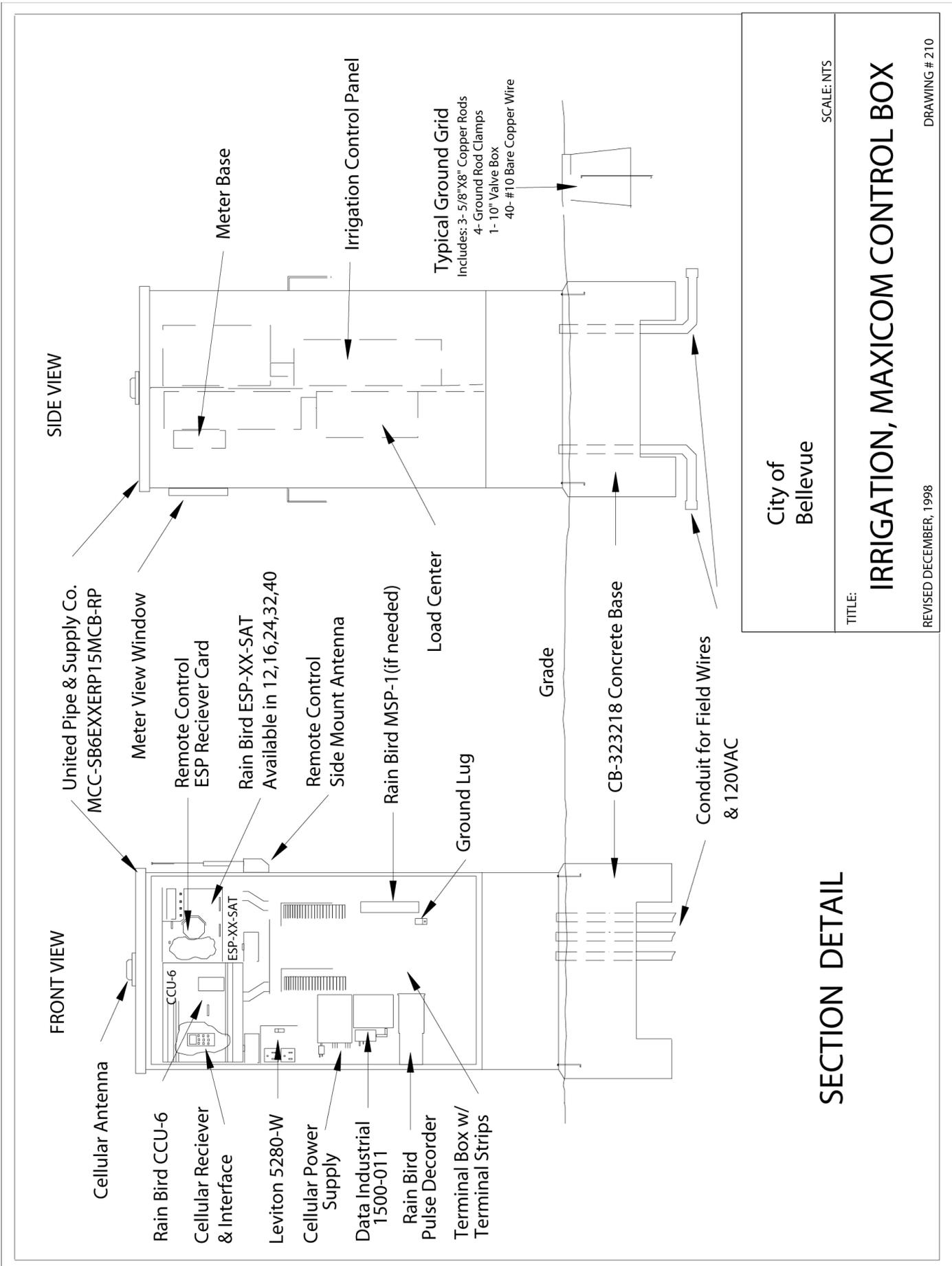
Fabric shall be 9 gauge 2 x 2 steel mesh, black vinyl coated - knuckled selvage top & bottom. Secure to posts & rails with 7/8" galv. staples @ 1' - 0" on center - fabric to be attached on side facing away from path. Fence material: 3 rail post & rail fence; manufacturer as approved by Owner.

| | |
|----------------|--------------|
| DRAWING NUMBER | 720 |
| SCALE | 3/4" = 1' 0" |
| REVISION DATE | DRAFT |
| DEPARTMENT | TRANS |

TITLE : FENCE - POST & (3) RAIL W/FABIC







City of Bellevue

TITLE:

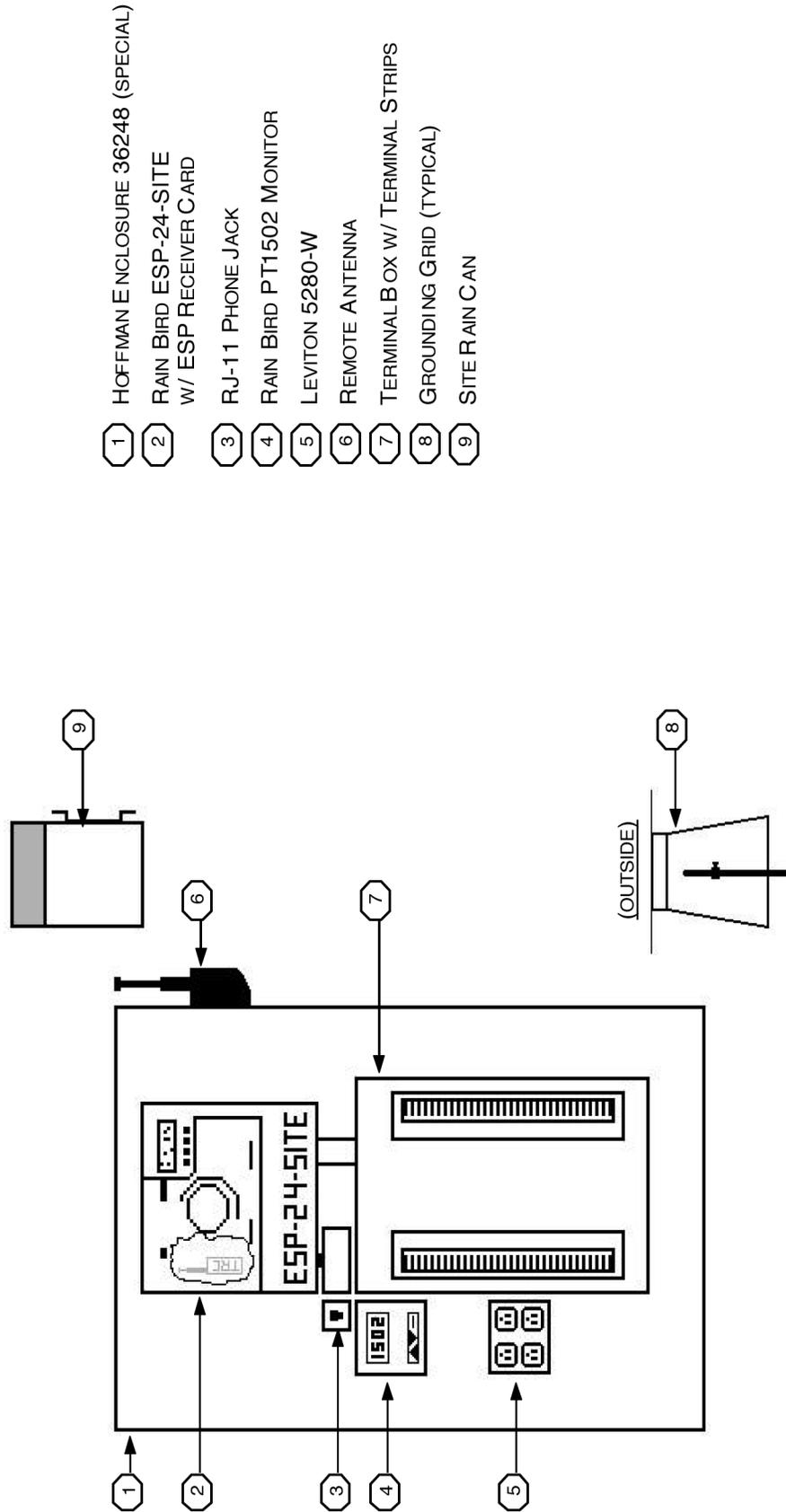
IRRIGATION, MAXICOM CONTROL BOX

SCALE: NTS

REVISED DECEMBER, 1998

DRAWING # 210

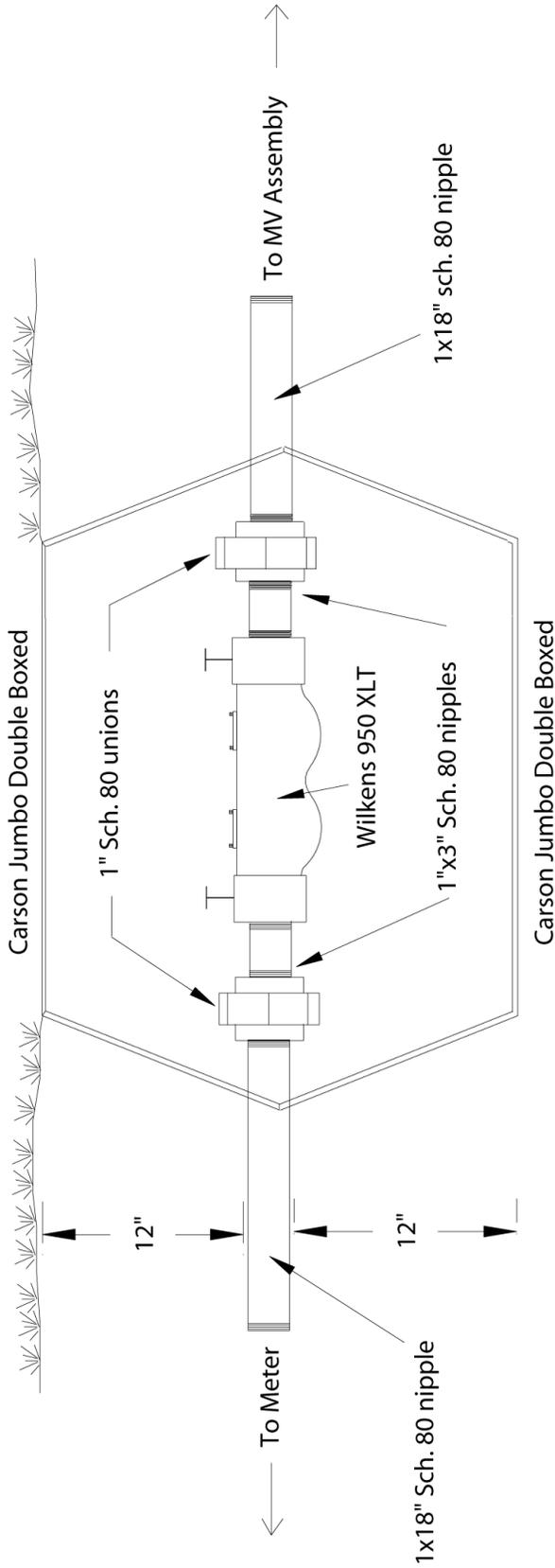
MAXICOM CONTROL CABINET



- ① HOFFMAN ENCLOSURE 36248 (SPECIAL)
- ② RAIN BIRD ESP-24-SITE W/ ESP RECEIVER CARD
- ③ RJ-11 PHONE JACK
- ④ RAIN BIRD PT1502 MONITOR
- ⑤ LEVITON 5280-W
- ⑥ REMOTE ANTENNA
- ⑦ TERMINAL BOX W/ TERMINAL STRIPS
- ⑧ GROUNDING GRID (TYPICAL)
- ⑨ SITE RAIN CAN

MCC-H1E24ERP15SRC-RP

SCALE: NOT TO SCALE



SECTION DETAIL

City of
Bellevue

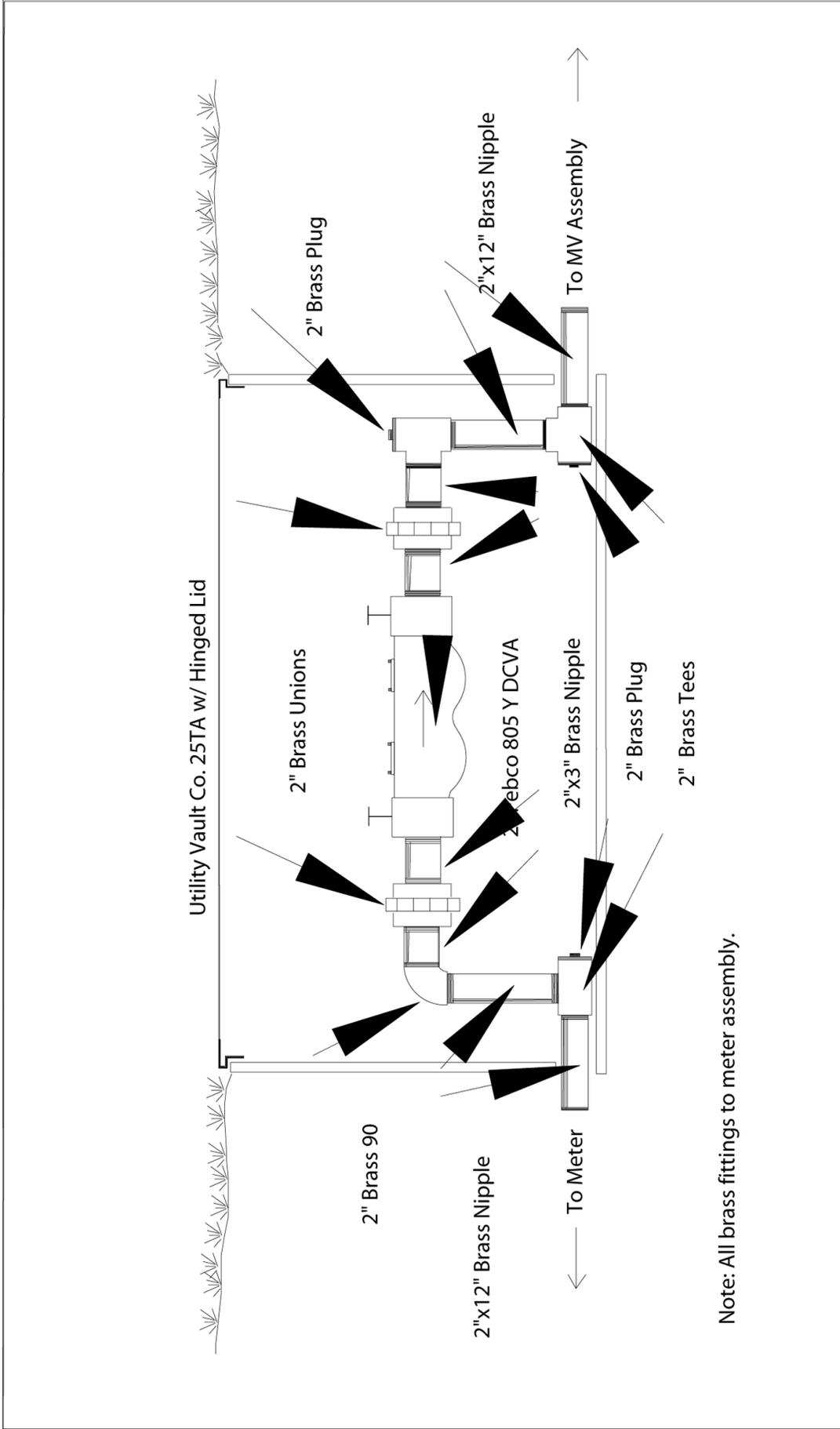
SCALE: NTS

TITLE:

IRRIGATION, DOUBLE CHECK VALVE ASSEMBLY 1"

REVISED DECEMBER, 1998

DRAWING # 202



Note: All brass fittings to meter assembly.

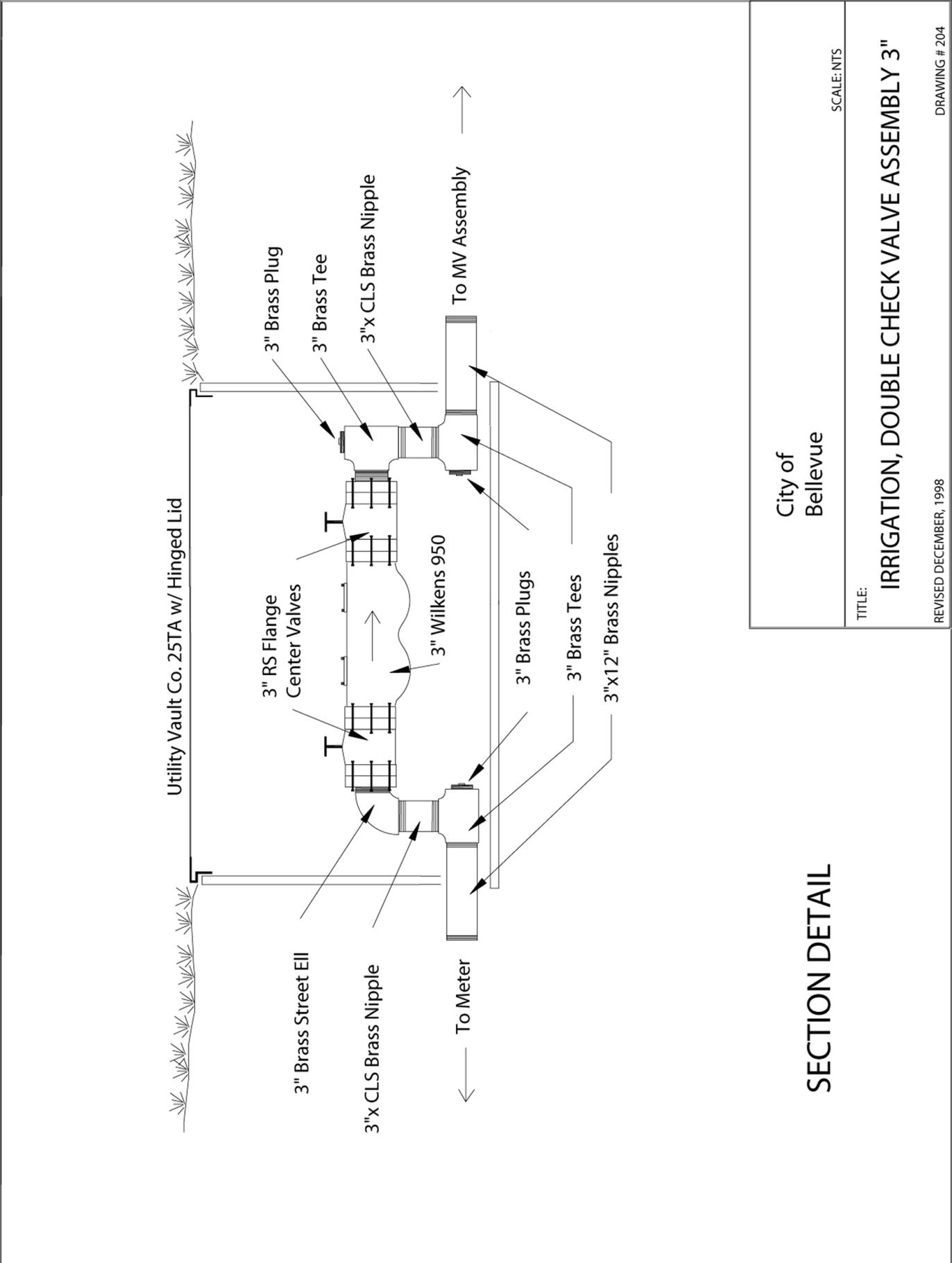
City of Bellevue

SCALE: NTS

TITLE: **IRRIGATION, DOUBLE CHECK VALVE ASSEMBLY 2"**

REVISED DECEMBER, 1998 DRAWING # 203

SECTION DETAIL



SECTION DETAIL

City of
Bellevue

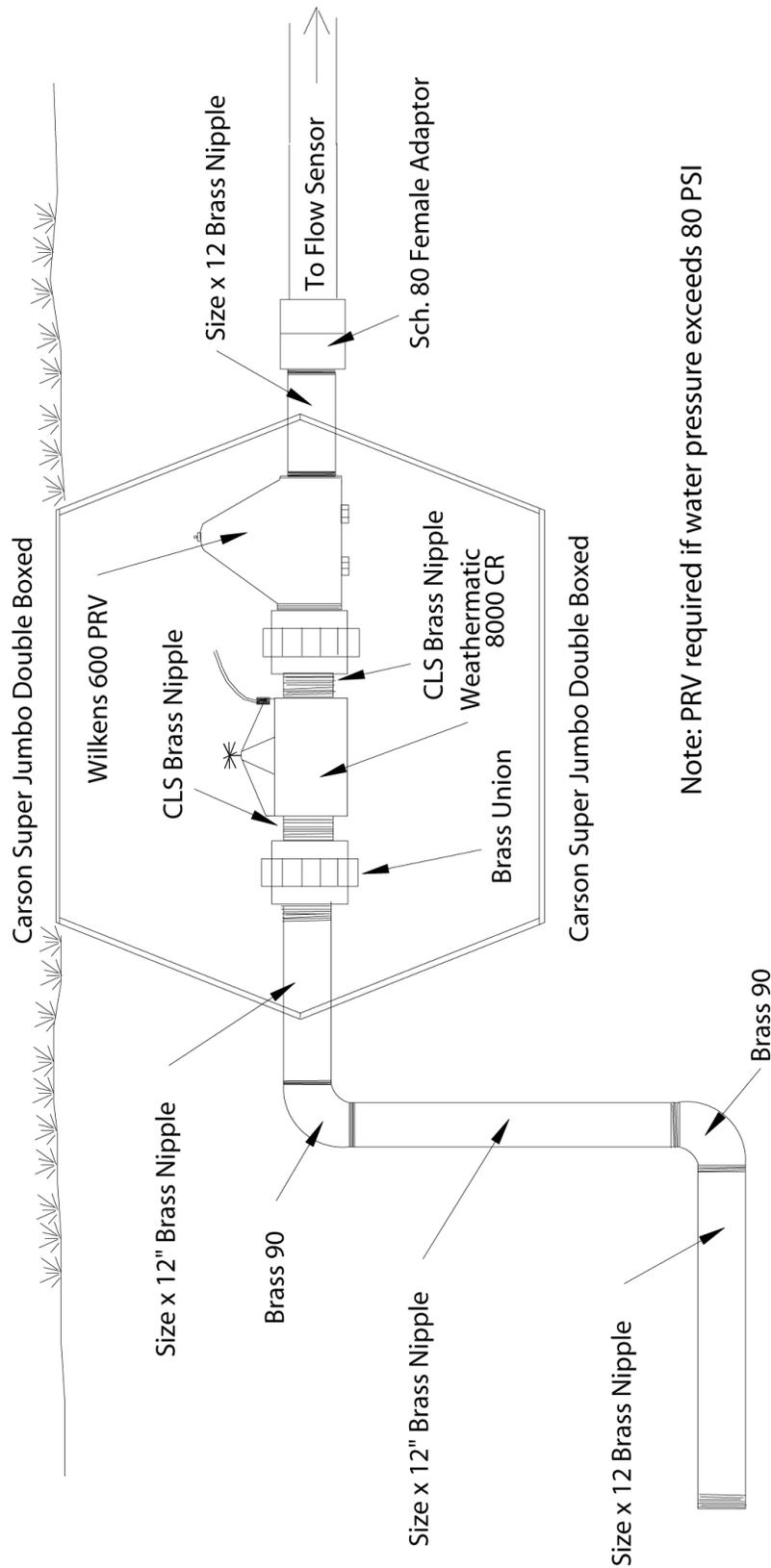
SCALE: NTS

TITLE:

IRRIGATION, DOUBLE CHECK VALVE ASSEMBLY 3"

REVISED DECEMBER, 1998

DRAWING # 204



Note: PRV required if water pressure exceeds 80 PSI

SECTION DETAIL

City of
Bellevue

SCALE: NTS

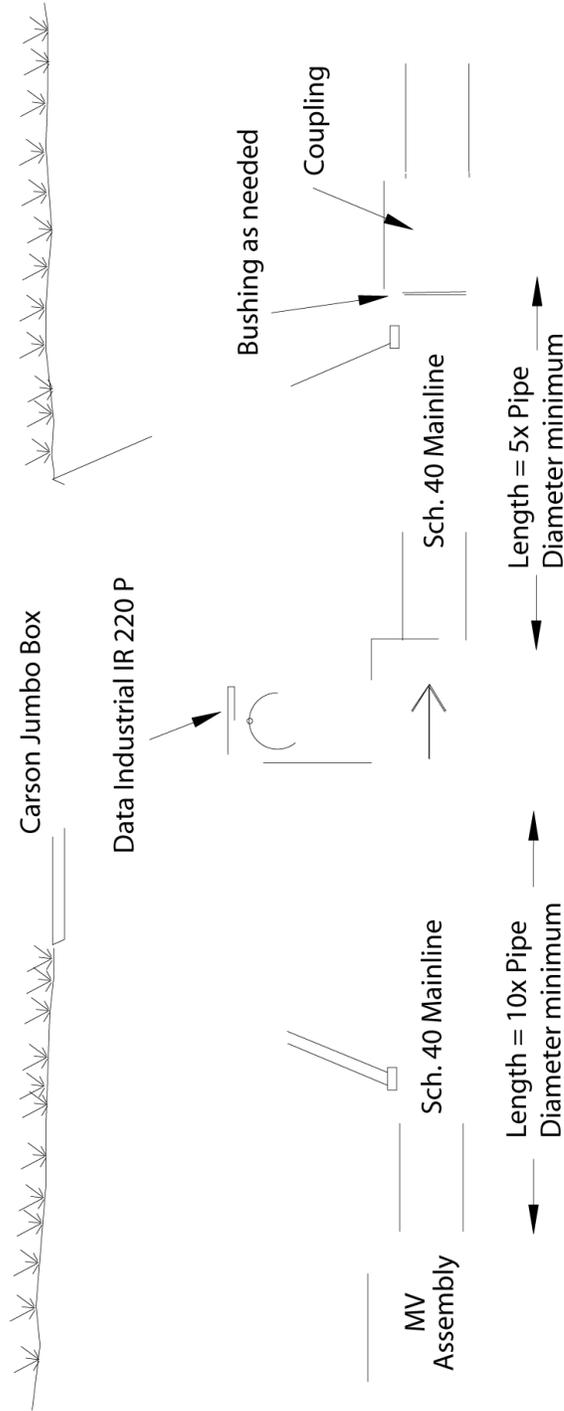
TITLE:

IRRIGATION, MASTER VALVE AND PRV ASSEMBLY

REVISED DECEMBER, 1998

DRAWING # 208

Note: Use ranger real electrical splice kit @ flow sensor
 Run continuous PE 89 6 pair wire from flow sensor to controller.



SECTION DETAIL

City of
 Bellevue

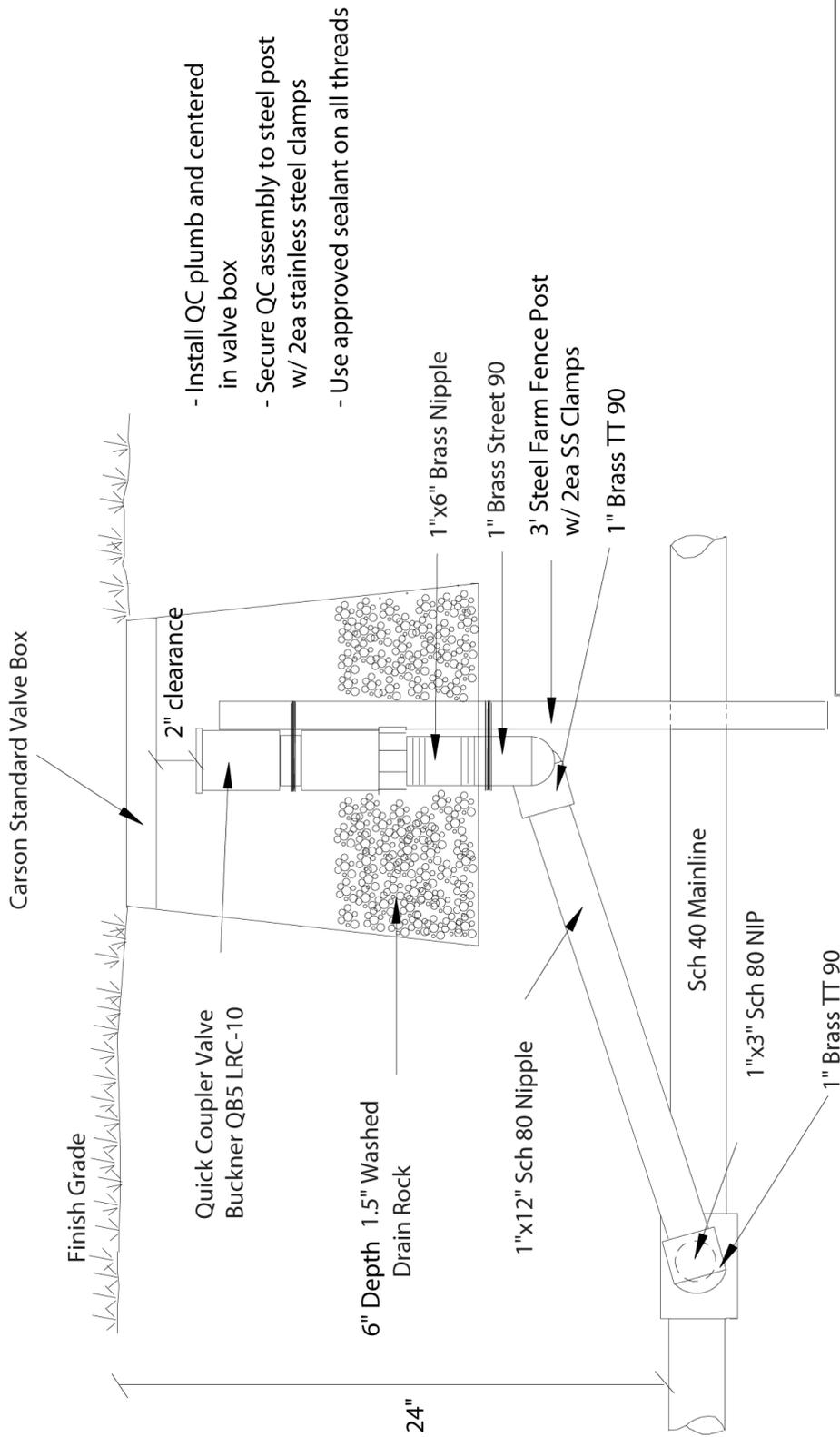
SCALE: NTS

TITLE:

IRRIGATION, PVC FLOW SENSOR

REVISED DECEMBER, 1998

DRAWING # 205



- Install QC plumb and centered in valve box
- Secure QC assembly to steel post w/ 2ea stainless steel clamps
- Use approved sealant on all threads

| | |
|--|---------------|
| City of Bellevue | SCALE: NTS |
| TITLE: IRRIGATION, QUICK COUPLER | DRAWING # 206 |
| REVISED DECEMBER, 1998 | |

SECTION DETAIL

Carson Standard (1" - 1.25") or Jumbo Valve Box (1.5" - 2") w/ locking lid

Brass Gate Valve same size as remote control valve

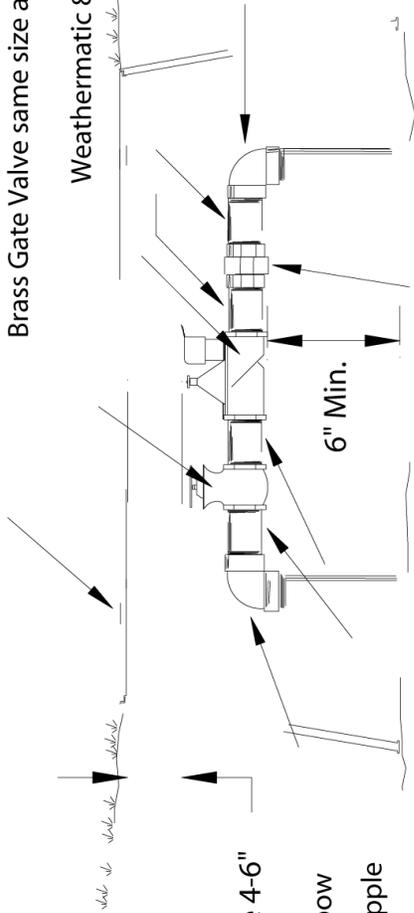
Weathermatic 8000-RCV Remote Control Valve

CLS Sch 80 PVC Nipple

Sch 80 PVC 90 Elbow

Sch 80 Nipple
Length as required

Sch 40 PVC 90 Elbow
as required to lateral size and depth



Clearance 4-6"

Sch. 80 PVC 90 Elbow

CLS Sch. 80 PVC Nipple

Sch. 80 PVC Nipple
Length as required

Sch. 40 PVC Tee

Sch. 80 Union

Sch. 80 ST Bushing

Sch. 40 PVC Mainline

City of Bellevue

SCALE: NTS

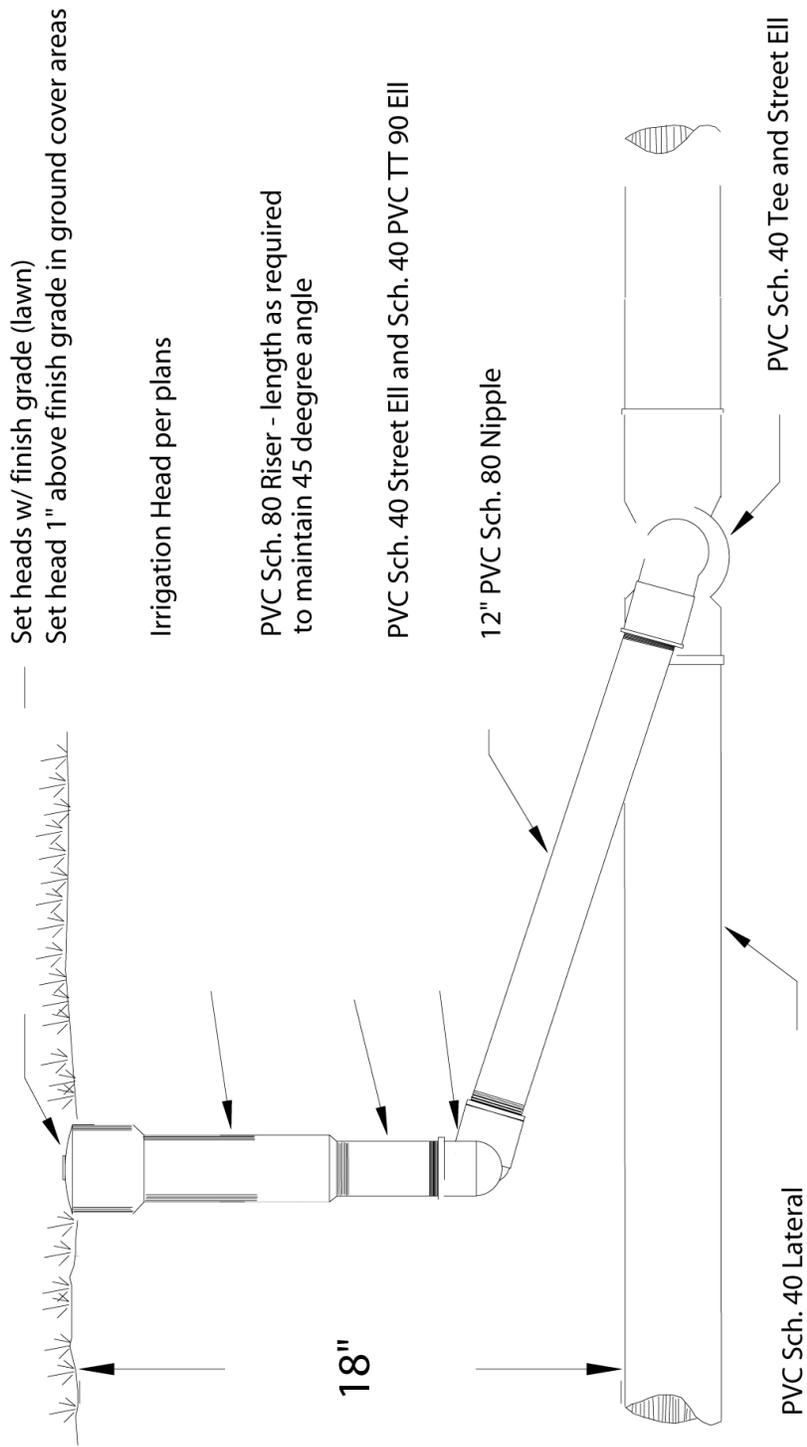
TITLE:

IRRIGATION, REMOTE CONTROL VALVE

REVISED DECEMBER, 1998

DRAWING # 201

Note: Swing joint assembly size determined by head inlet size.



SECTION DETAIL

City of
Bellevue

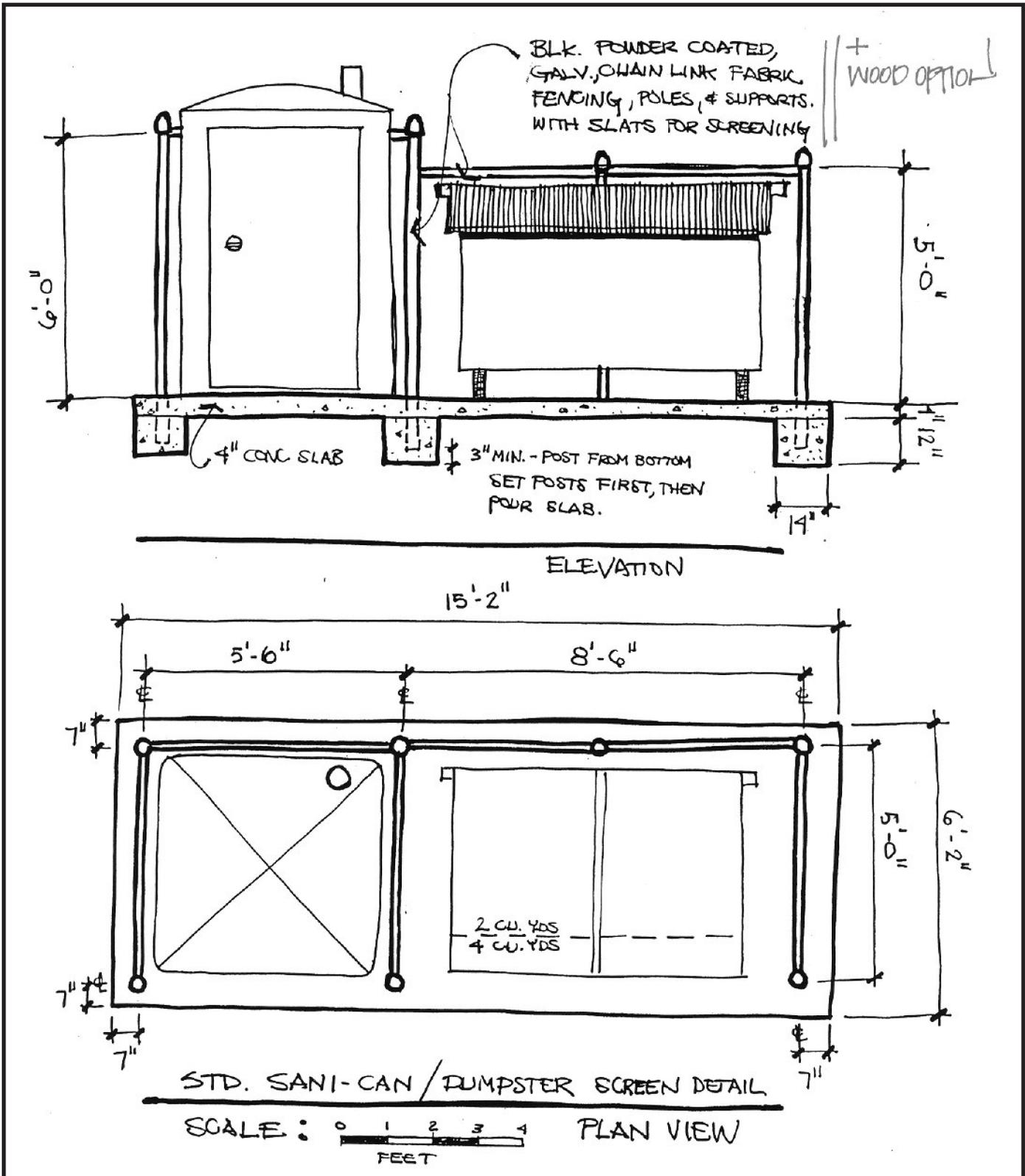
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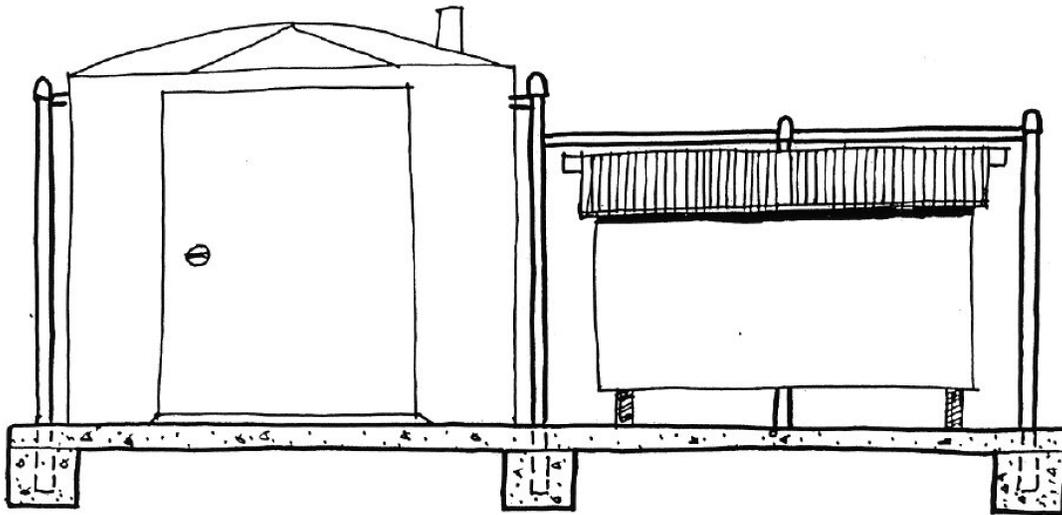
TITLE:

IRRIGATION, SWING JOINT ASSEMBLY

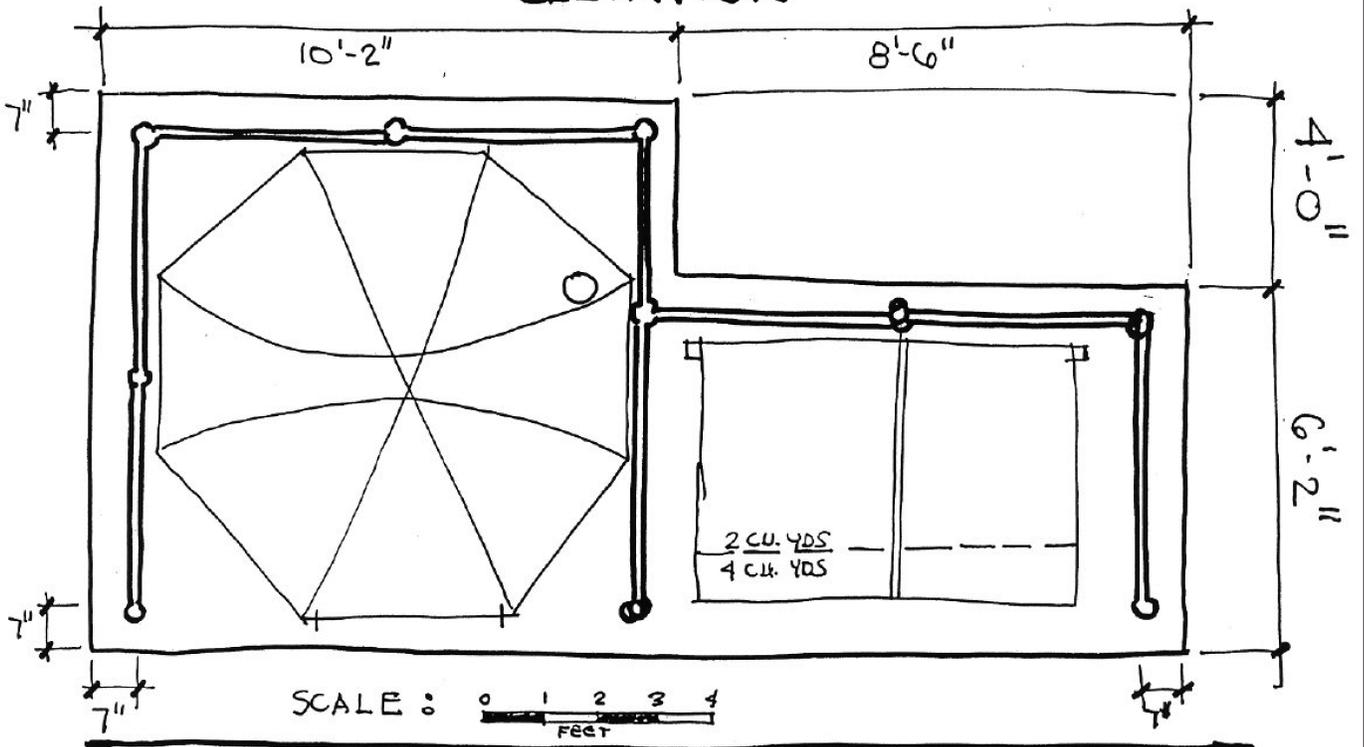
REVISED DECEMBER, 1998

DRAWING # 207

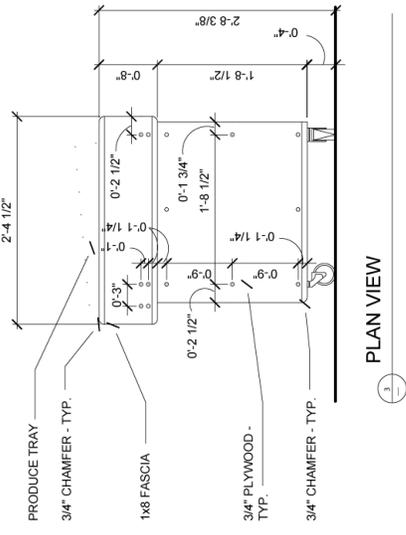
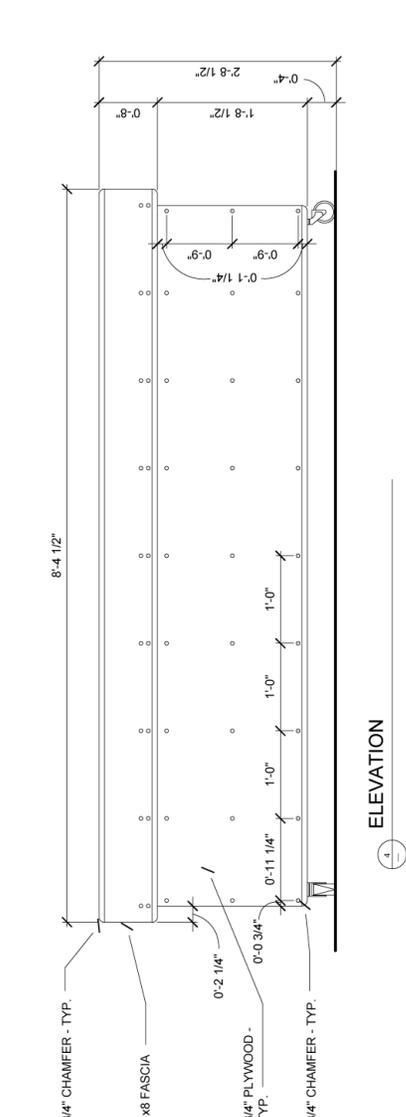
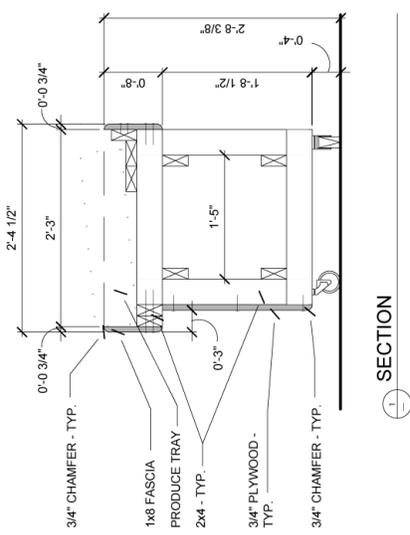
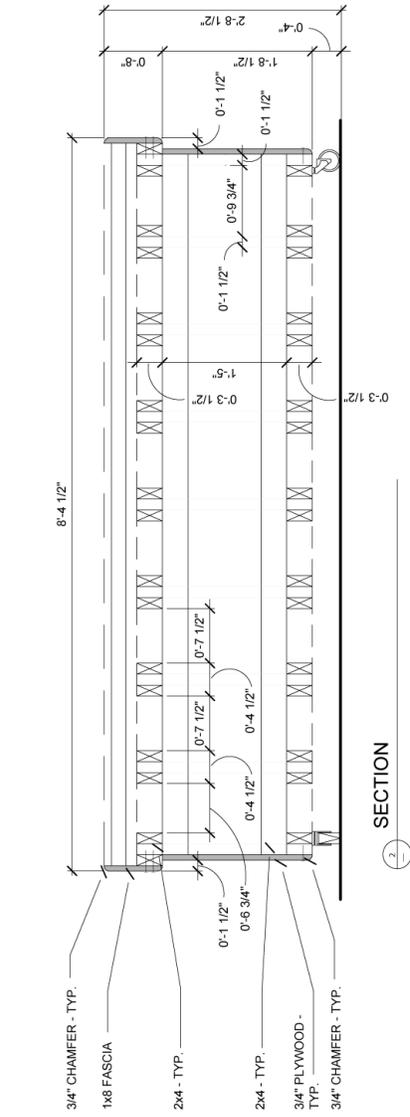




**WHEEL CHAIR ACCESSABLE SANI-CAN/DUMPSTER
ELEVATION**



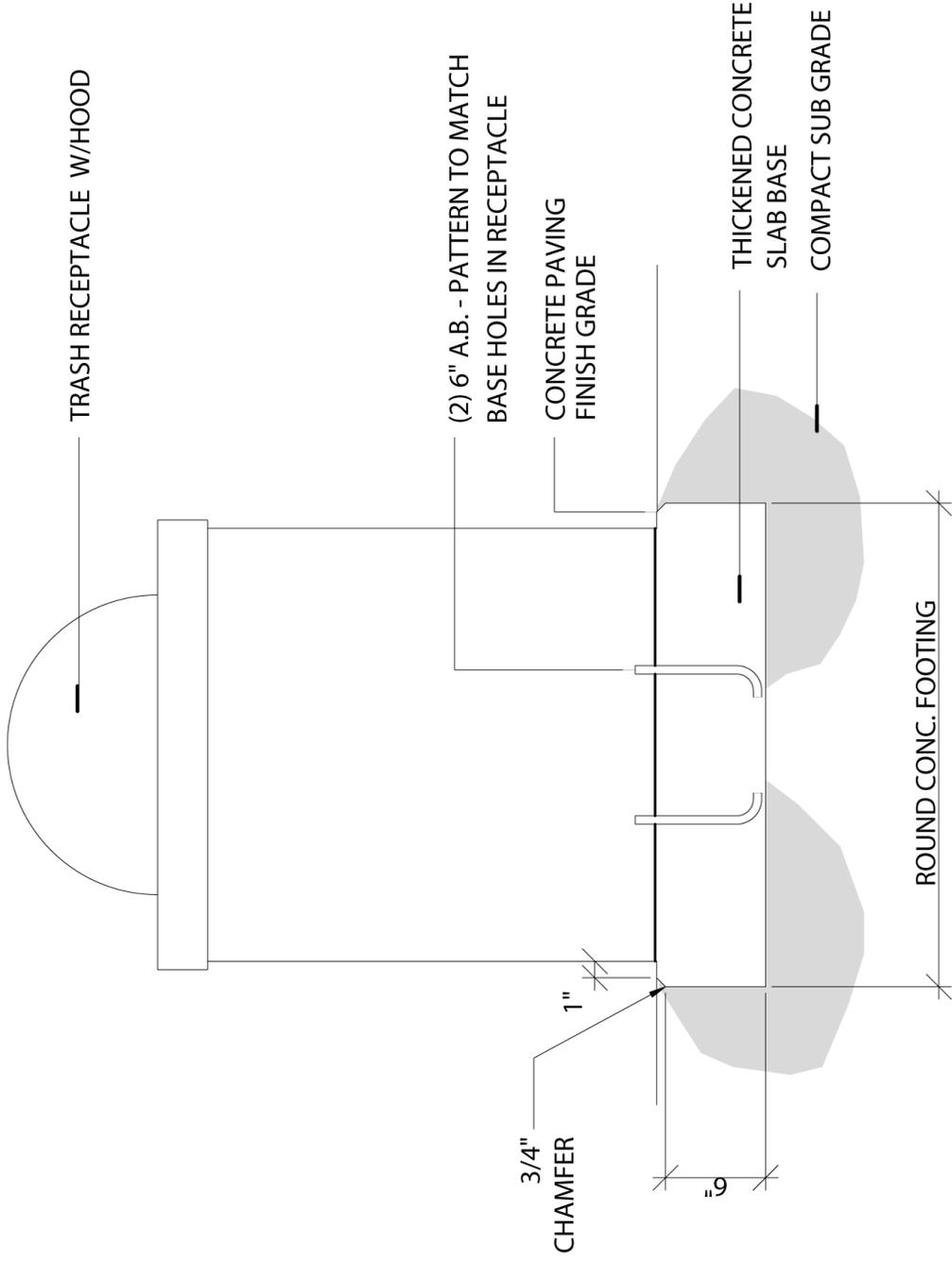
PLAN VIEW



| | |
|----------------|--------------|
| DRAWING NUMBER | - |
| SCALE | 1/2" = 1' 0" |
| REVISION DATE | Draft - 2/02 |
| DEPARTMENT | PARKS |

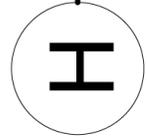
TITLE: PRODUCE STAND - MOVABLE





TRASH RECEPTACLE INSTALLATION

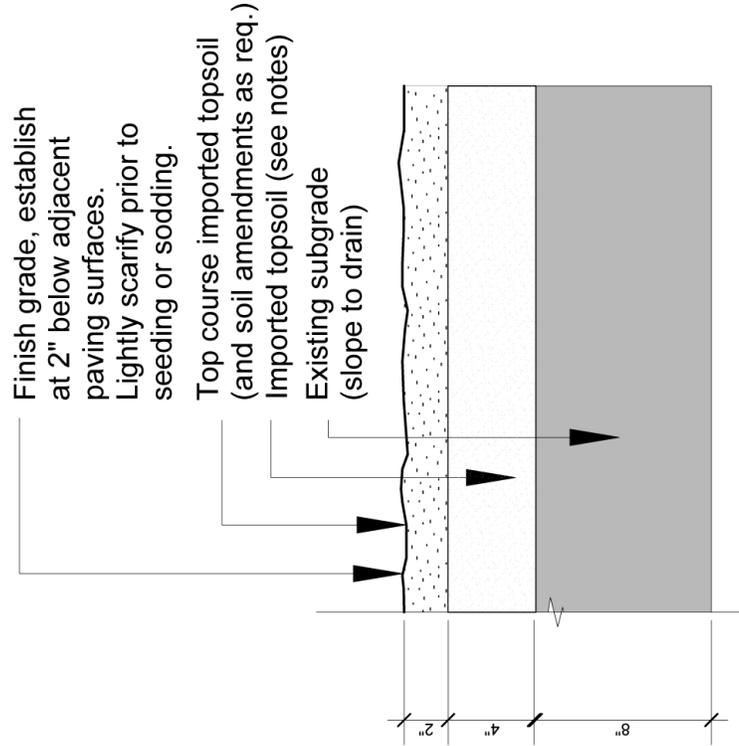
NOT TO SCALE



TRSH2

Notes:

1. Topsoil shall be sandy loam soil with a particle size of 7/16 inches or less and a pH between 5.5. and 7.5. Topsoil shall be free of all rock debris and other foreign material over 1" diameter, and all weeds, weed seeds and plant propagules. Topsoil shall have a moisture content less than that which would allow visible free water and greater than that which would produce dust when the material is handled. Topsoil may be mixed with up to 25% compost or peat.
2. Rip and till subgrade to a depth no less than 8 inches below the finished subgrade surface prior to installing topsoil and amendments. Remove all non-conforming (see above) debris from surface of subgrade.
3. Place first course of topsoil and till interface of subgrade and topsoil to a minimum depth of 4 inches. Compact topsoil to 85% of dry density.
3. Place final course of topsoil (and soil amendments if required) to a 2" depth (min.)
4. Seed/sod types for turfed areas shall consist of drought-tolerant, deep-rooted grass species such as fescue/rye blends. Grass seed shall be certified free of weed seed and contain less than 1.5% inert matter. Grass seed shall be distributed at the rate of 7lbs per 1,000 square feet.



Note all dimensions indicate compacted depth

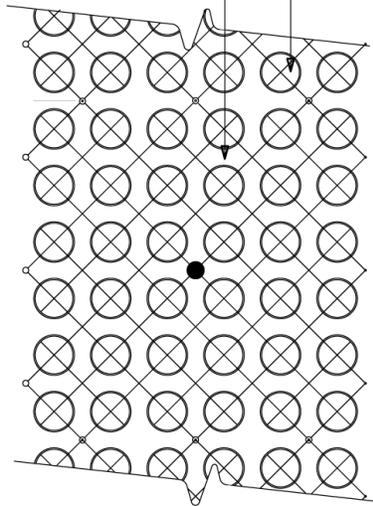
| | |
|----------------|----------------|
| DRAWING NUMBER | NEW-1 |
| SCALE | 1 1/2" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

TITLE: TURF/LAWN PLANTING

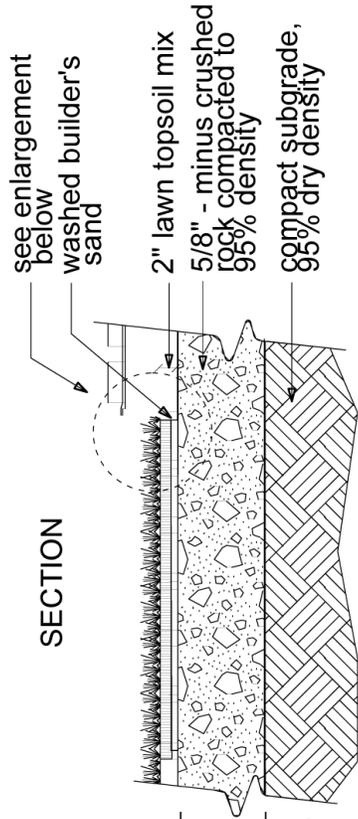


City of Bellevue

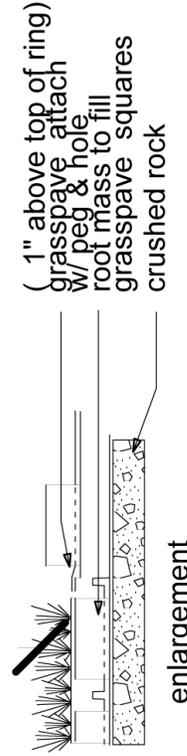
PLAN



SECTION



Top of grass root mass

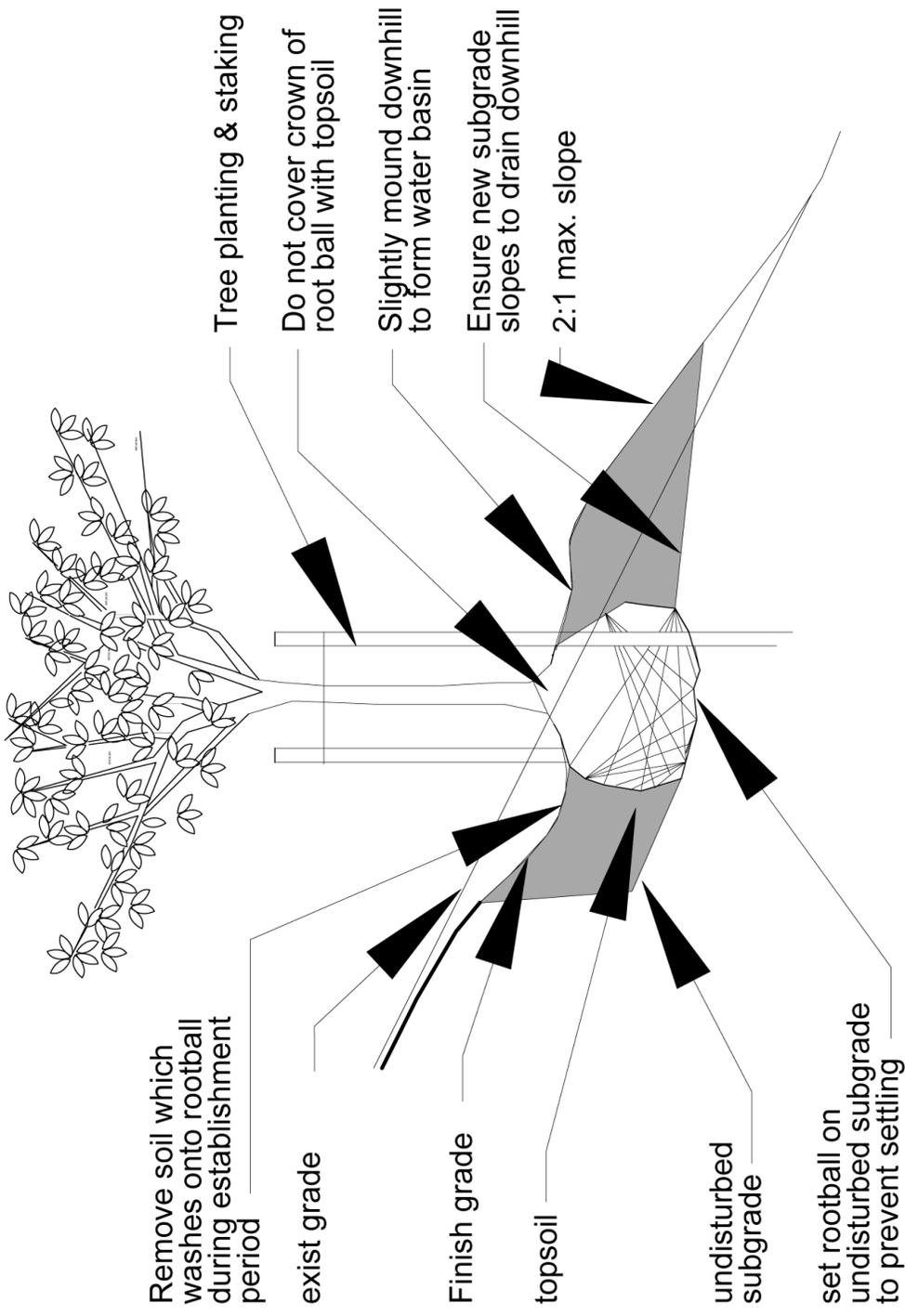


Notes:
 1. Available through "Invisible Structures, Inc."
 phone: 1-800-233-1510
 2. If material to be used for Fire access, provide calculations to support design loads

| | |
|----------------|----------------|
| DRAWING NUMBER | NEW-2 |
| SCALE | 1 1/2" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

TITLE : TURF/LAWN REINFORCEMENT





NOTE:
 this detail applies to tree
 installations on slopes exceeding 3:1

| | |
|----------------|---------|
| DRAWING NUMBER | New-8 |
| SCALE | NTS |
| REVISION DATE | 6/10/00 |
| DEPARTMENT | TRANS |

TITLE: TYPICAL SLOPE PLANTING

City of Bellevue

asphalt or concrete paving

C.I.P. or extruded conc. curb (see road plan)

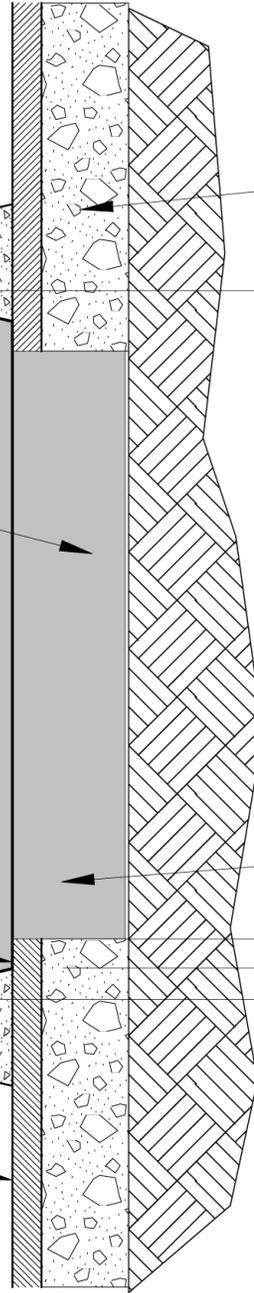
Remove asphalt as required to install irrigation heads within 4 inches of curb (typ.)

Finish grade of turf/mulch (sod F.G. flush w/top of curb, mulch 1 inch below top of curb)

Crown height as indicated on grading or landscape plan

5% Min.
Typical

remove crushed top course & const. debris, scarify new subgrade to 6" depth & backfill w/imported topsoil (specified elsewhere)



crushed topcourse/roadbed

Imported topsoil as specified elsewhere, compact to 85% dry density

VARIES"

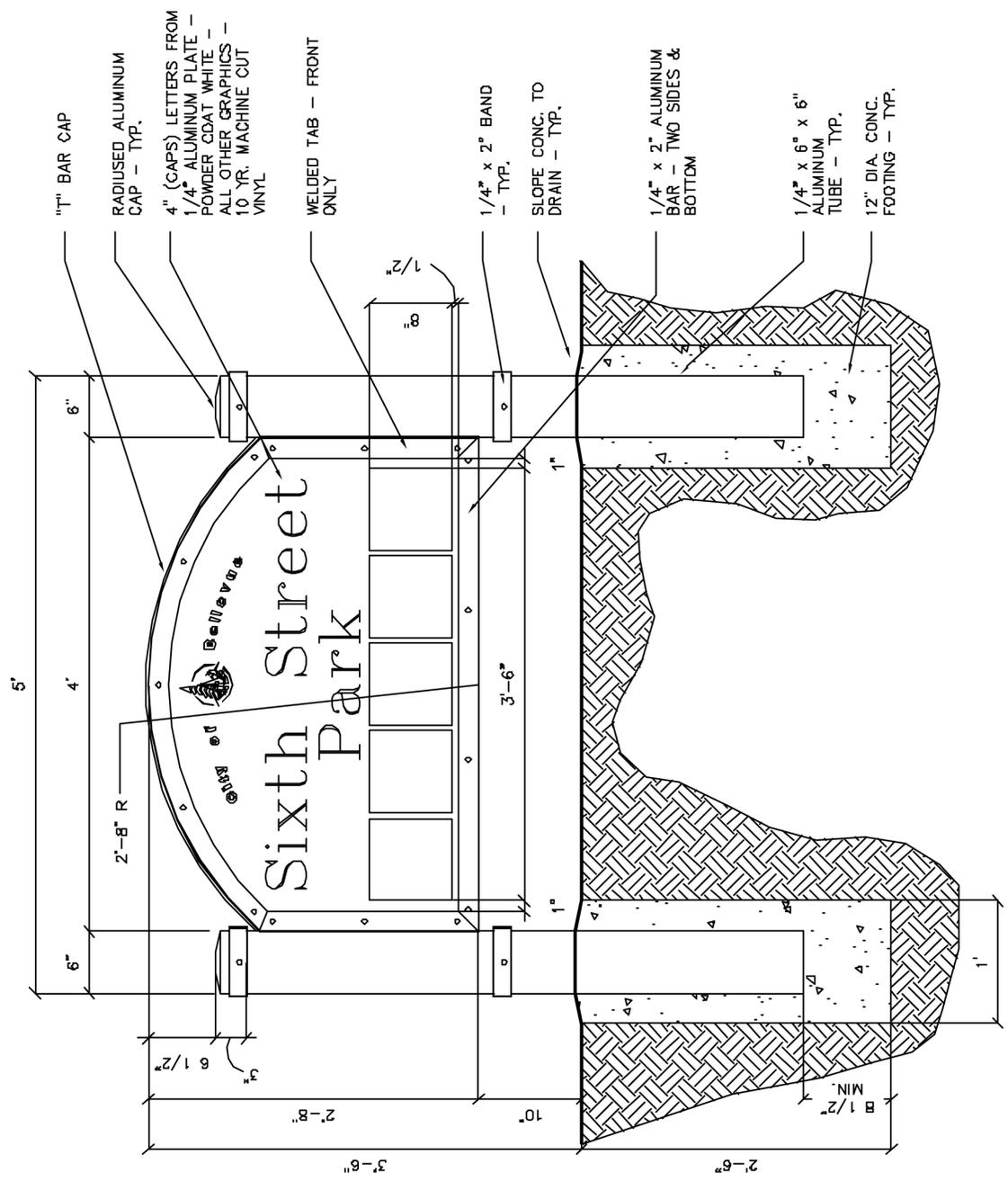
| | |
|----------------|------------|
| DRAWING NUMBER | NEW-7 |
| SCALE | 1" = 1' 0" |
| REVISION DATE | 3/01 |
| DEPARTMENT | PARKS |

MEDIAN/PLANTING STRIP PREPARATION DRAWING

TITLE :



City of Bellevue



- "I" BAR CAP
- RADIUSED ALUMINUM CAP - TYP.
- 4" (GAPS) LETTERS FROM 1/4" ALUMINUM PLATE - POWDER COAT WHITE - ALL OTHER GRAPHICS - 10 YR. MACHINE CUT VINYL
- WELDED TAB - FRONT ONLY
- 1/4" x 2" BAND - TYP.
- SLOPE CONC. TO DRAIN - TYP.
- 1/4" x 2" ALUMINUM BAR - TWO SIDES & BOTTOM
- 1/4" x 6" x 6" ALUMINUM TUBE - TYP.
- 12" DIA. CONC. FOOTING - TYP.

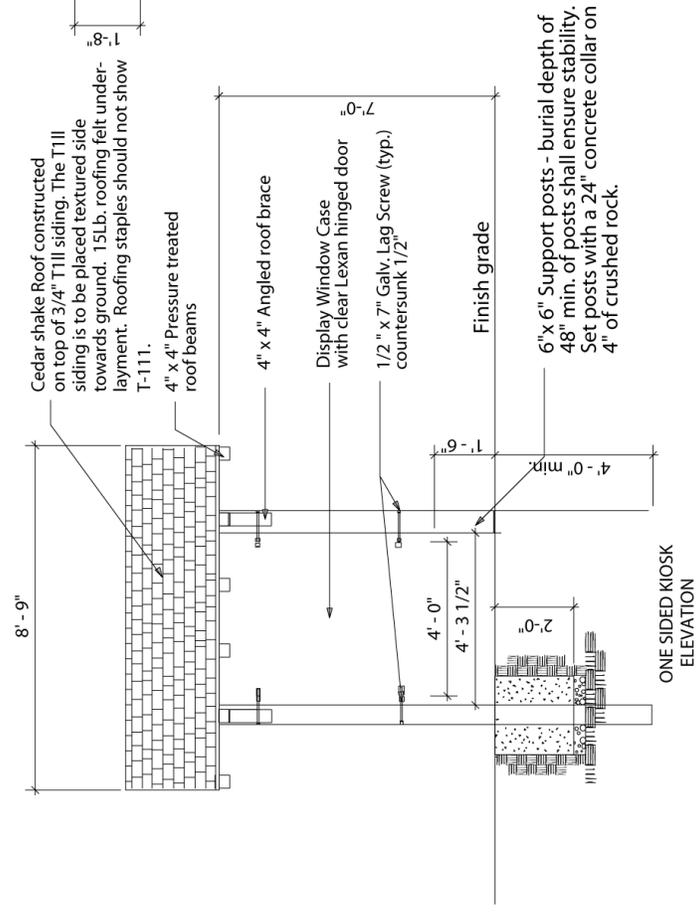
NOTE:
 ALL LETTERS TO BE PALATINO FONT EXCEPT 'CITY OF BELLEVUE' ARCH TO BE HELVETICA
 POWDER COAT COLOURS:
 GREY - TIGER DRYLAC, SERIES 49
 METALIC IRON GLIMMER; POLYESTER SYSTEM, P3 #70200
 BLUE - TIGER DRYLAC, SERIES 49
 SMOOTH GLOSSY POLYESTER SYSTEM, COLOUR RAL #6018

| | |
|----------------|-------|
| DRAWING NUMBER | X |
| SCALE | NTS |
| REVISION DATE | DRAFT |
| DEPARTMENT | PARKS |

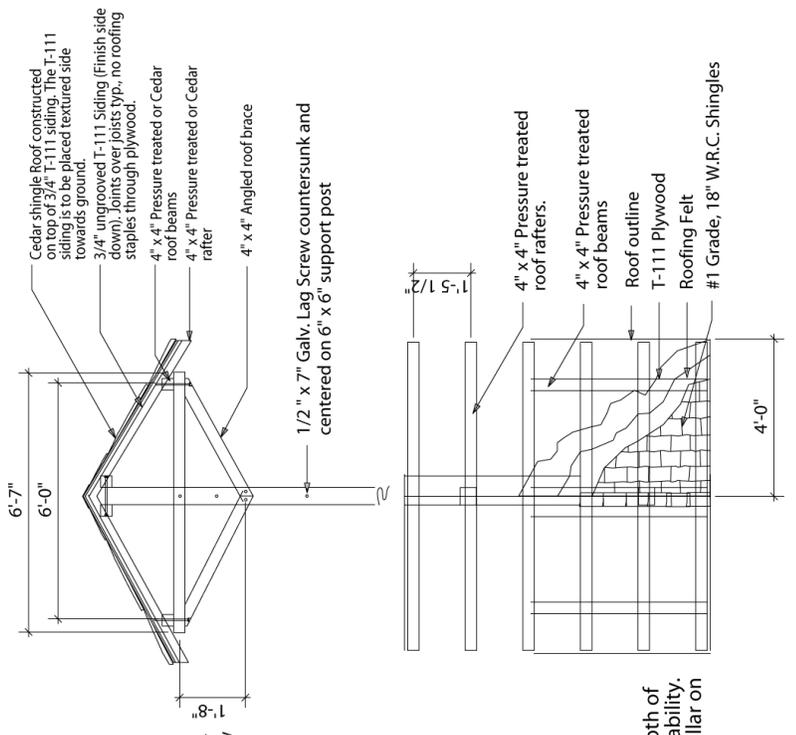
TITLE: SIGNAGE: PARK ENTRY (SMALL)



A 3-Sided Kiosk Plan View
Scale: 1/2"=1'-0"



D One-Sided Kiosk Elevation
Scale: 1/2"=1'-0"



E Roof Framing Plan
Scale: 1/2"=1'-0"

B 3-Sided Kiosk Perspective

Workload Time Standards

| Site Name: | Site #: | WO#: |
|--|----------------|------|
| Activity | Time Std. | |
| TURF: | | |
| Mowing | 170 sq.ft./min | |
| Turf Trimming | 50 ft./min | |
| Turf Edging | 37 ft./min | |
| Weedeating Turf | 105 ft./min | |
| Fertilize | 45 ft./min | |
| Herbicide | 45 ft./min | |
| TREES, SHRUBS, & GROUND COVER BEDS: | | |
| Hand Weeding | 7 sq.ft./min | |
| Plant Trimming | 7 ft./min | |
| Pruning | 65 sq.ft./min | |
| Mulching Trees | 2 min./tree | |
| Watering Trees | 5 min./tree | |
| Barking Beds | 13 sq.ft./min | |
| Herbicide | 45 ft./min | |
| TRAILS: | | |
| Raking Trails | 37 ft./min | |
| Resurfacing | 1.2 ft./min | |
| Weedeating Edge | 22 ft./min | |
| Weedeating Fence | 78 ft./min | |
| Weedeating Trail | 22 ft./min | |
| Trail Edge Pruning | 207 ft./min | |
| Hedge Trimming | 7 ft./min | |
| Sanding Bridges | 13 ft./min | |
| Brush Hog | 120 ft./min | |
| OTHER: | | |
| Backpack Blowing | 94 ft./min | |
| Walk-behind Blower | 125 ft./min | |
| Parking Lot Sweep | 1 site/45 min. | |
| Sign Maintenance | 1.5 min./sign | |
| Inspections | 1 site/hr. | |

Formal Park (example)

Annual Maintenance Schedule Guidelines
 Estimated Frequency by Month

| Description of Work: | J | F | M | A | M | J | J | A | S | O | N | D | Est. Freq. | |
|---|-----------|---|-----------------------------------|---|---|---|---|---|---|---|---|----|------------|----|
| TURF: | | | | | | | | | | | | | | |
| Mowing | 0 | 0 | Weekly March 1 through October 31 | | | | | | | | | | 0 | 35 |
| Rough Mow | 0 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 0 | 16 | |
| Trimming | 0 | 0 | Weekly March 1 through October 31 | | | | | | | | | | 0 | 35 |
| Edging | 0 | 0 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 0 | 0 | 18 | |
| Fertilize | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 4 | |
| Herbicide | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | |
| Renovation | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| TREES, SHRUBS, & GROUND COVER: | | | | | | | | | | | | | | |
| Weeding | 1 | 1 | 3 | 5 | 4 | 4 | 5 | 4 | 5 | 2 | 1 | 1 | 36 | |
| Trimming G.C | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 4 | |
| Pruning Shrubs | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 4 | |
| Pre-emergent | | | | | | | | | | | | | | |
| Herbicide | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| Fertilize | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| Sweeping | Weekly | | | | | | | | | | | 52 | | |
| Weeding hard surfaces | As Needed | | | | | | | | | | | | | |

Mini Park (example)

Annual Maintenance Schedule Guidelines
 Estimated Frequency by Month

| Description of Work: | J | F | M | A | M | J | J | A | S | O | N | D | Est. Freq. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|------------|
| TURF: | | | | | | | | | | | | | |
| Mowing | | | 3 | 5 | 4 | 4 | 5 | 4 | 5 | 2 | | | 32 |
| Trimming | | | 3 | 5 | 4 | 4 | 5 | 4 | 5 | 2 | | | 32 |
| Edging | | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | | 16 |
| Fertilize | | | | 1 | | 1 | | 1 | | 1 | | | 4 |
| Herbicide | | | 1 | | 1 | | | | 1 | | | | 3 |
| TREES, SHRUBS & GROUND COVER BEDS: | | | | | | | | | | | | | |
| Weeding | 1 | 1 | 3 | 5 | 4 | 4 | 5 | 4 | 5 | 2 | 1 | 1 | 36 |
| Pruning Shrubs | | | | 1 | | 1 | | | 1 | | 1 | | 4 |
| Pre-emergent Herbicide | 1 | | | | | | | | | | | 1 | |
| Mulch Beds | | 1 | | | | | | | | | | | 1 |

Streetscape (example)

Annual Maintenance Schedule Guidelines
Estimated Frequency by Month

| Description of Work: | J | F | M | A | M | J | J | A | S | O | N | D | Est. Freq. |
|----------------------|---|---|---|---|---|---|---|---|---|---|---|---|------------|
| Mowing | | | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | | | 35 |
| Trimming | | | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | | | 35 |
| Edging | | | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | | 18 |
| Fertilize | | | 1 | | | | 1 | | | 1 | | | 3 |
| Herbicide | | | | | 1 | | | | | | | 1 | 2 |
| Bed Weeding | 1 | 1 | 3 | 5 | 4 | 4 | 5 | 4 | 5 | 2 | 1 | 1 | 36 |
| Trim Ground Cover | | | | 1 | | 1 | | 1 | | 1 | | | 4 |
| Prune Shrubs | | | | 1 | | 1 | | 1 | | 1 | | | 4 |
| Hard Surface Sweep | 2 | 2 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | | | 39 |
| Hard Surface Weed | | | | | | | | | | | | | as needed |
| Leaf Removal | | | | | | | | | | 1 | 4 | 4 | 9 |
| Litter | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 52 |
| Encroachment | | | 1 | | 1 | | 1 | | | 1 | | | 4 |
| Irrigation | | | | | | | | | | | | | as needed |

Trails/Greenbelt (example)

Annual Maintenance Schedule Guidelines
 Estimated Frequency by Month

| Description of Work: | J | F | M | A | M | J | J | A | S | O | N | D | Est. Freq. |
|----------------------|---|---|---|---|---|---|---|---|---|---|---|---|------------|
| Weedeating Edge | | | 1 | 1 | 2 | 2 | 2 | 1 | 1 | | | | 10 |
| Weedeating Fence | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | 7 |
| Weedeating Trail | | | 2 | 2 | 2 | 2 | 2 | 2 | 1 | | | | 13 |
| Mowing | | | 3 | 4 | 4 | 4 | 4 | 4 | 3 | | | | 26 |
| Edging | | | 3 | 4 | 4 | 4 | 4 | 4 | 3 | | | | 26 |
| Hand Weeding | 1 | 1 | 3 | 5 | 4 | 4 | 5 | 4 | 5 | 2 | 1 | 1 | 36 |
| Fertilizing | | | | 1 | | 1 | | | | 1 | | | 3 |
| Herbicide | | | | 1 | | 1 | | | 1 | | | | 3 |
| Trail Edge Pruning | | 1 | | | | | | | | | | | 1 |
| Watering Trees | | | | | | 4 | 4 | 4 | 2 | | | | 14 |
| Mulching Trees | | | 1 | | | | | | | | | | 1 |
| Barking Beds | | | 1 | | | | | | | | | | 1 |
| Sanding Bridges | 1 | 1 | | | | | | | | | | 1 | 3 |
| Backpack Blowing | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 48 |
| Walk-behind Blower | | | 2 | 2 | 2 | 2 | 1 | | | 2 | 2 | 2 | 15 |
| Parking Lot Sweep | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 48 |
| Sign Maintenance | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 |
| Inspections | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 24 |

Forest Enhancement/NGPA (example)

Annual Maintenance Schedule Guidelines
Estimated Frequency by Month

| Description | J | F | M | A | M | J | J | A | S | O | N | D | Est. Freq. |
|-----------------------|---|---|---|---|---|---|---|---|---|---|---|---|------------|
| Invasive Weed Removal | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 7 | |
| Herbicide | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | 7 |
| Mowing | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 24 |
| Watering | | | | | 2 | 2 | 2 | 2 | 2 | | | | 10 |

City of Bellevue

WATER SHORTAGE CONTINGENCY PLAN

Bellevue’s Utilities Department has a Water Shortage Contingency Plan (WSCP), which provides guidelines for the Utilities Department to manage water supply and demand in the event of a supply disruption. This plan addresses both progressive situations, such as those that are weather related and more drastic and immediate situations such as facility emergencies (for example, a water main break) The plan is designed to be flexibly applied according to the specific situation and includes communications actions, demand management actions, and supply alternatives.

SECTION I (OVERVIEW)

INTRODUCTION

Pursuant to the Water Utility Code (Chapter 24.02 of the Bellevue City Code, this Water Shortage Contingency Plan (hereafter WSCP) provides guidelines for Bellevue Utilities Department (hereafter BUD) to manage water supply and demand within all areas supplied water by BUD in the event of a water supply disruption. The WSCP addresses progressive situations, such as those that are weather-related, and more drastic and immediate situations, such as facility emergencies, like a pipeline break. Pursuant to Sections 24.02.030 and 24.02.060 of the Water Utility Code, the BUD Water Shortage Team (hereafter WST, see Appendix “A”) has primary responsibility for administering and implementing the WSCP.

The WSCP is designed to be used during highly unusual and infrequent events. The WSCP is intended to be implemented in coordination with Seattle Public Utilities (hereafter SPU) Regional Water Shortage Contingency Plan (hereafter RWSCP) in the event of a regional supply disruption, or independently by BUD in the event of a local supply disruption.

This WSCP updates and replaces BUD’s 1994 Water Shortage Contingency Plan. The WSCP will be reviewed and updated as necessary by January 31st of each year. The WSCP is Addendum “C” to the BUD Emergency Response Book and supplements the 1998 Water Comprehensive Plan.

OBJECTIVE OF THE PLAN

The WSCP establishes actions and procedures for managing water supply and demands during water shortages. The primary objectives of the WSCP are to maintain essential public health and safety, and minimize adverse impacts on the economic activity, environmental resources, and quality of life within BUD’s water service area.

COORDINATION WITH OTHER EMERGENCY PLANNING

Implementation of the WSCP will be coordinated with the City’s Emergency Operations Committee (hereafter EOC). The WST shall brief the EOC via the City’s Emergency Preparedness Manager, on the status of the following: water shortage, implementation of WSCP Stages, water use restrictions that are being implemented, and how restrictions may impact other City departments’ operating activities.

RELATIONSHIP TO RWSCP

BUD is responsible for administering a local WSCP. Because BUD, along with 25 other water purveyors, purchases water from the SPU regional supply system, any regional drought or emergency situation facing SPU will also affect BUD. SPU, together with BUD, its other wholesale purveyors, and other stakeholders, developed the RWSCP on the premise that an effective demand management strategy must be regionally consistent. This is based on several considerations:

- Public support and cooperation is likely to be higher if actions are equitable, i.e., all water users are experiencing the same service level and degree of hardship;
- Uniform messages and information are easier for the public to understand and easier to distribute through the media, which are key in communicating information to the public; and,
- Consistent demand management actions make it easier for SPU to forecast demand reductions, which is essential to effectively manage the system during a supply disruption.

WSCP APPLICATION TO WHOLESALE SERVICE AREAS

The provisions of the WSCP apply to all areas and customers provided water by BUD pursuant to sections 24.02.030 and 24.02.050 (v) of the Water Utility Code. This includes but is not limited to all retail and wholesale customers and areas served by inter-local agreements, both within and outside Bellevue's city limits.

COMPLIANCE WITH THE WATER CODE AND WSCP

Pursuant to section 24.02.200 (c) of the Water Utility Code, the waste of water is prohibited at all times. Further, pursuant to section 24.02.280 of the Water Utility Code, violations of the Code or restrictions in water use per the WSCP are subject to fines and penalties.

SECTION 2 (DROUGHT MANAGEMENT STRATEGY)

CAUSES OF WATER SUPPLY SHORTAGES

- Water supply disruptions can occur for a variety of reasons. A weather related water shortage, generally referred to as a drought, is one category of particular importance to SPU and BUD. Droughts are naturally occurring but unpredictable weather events of varying frequency, duration, and severity. In the region served by the SPU regional water system, available data indicate a very low probability of a multi-year drought, but the region has experienced short-term droughts.
- The Puget Sound region, including Seattle and Bellevue, is generally faced with a relatively dry summer period. Only about 5 of our 38 – 40 inches of annual precipitation falls during the summer months. The SPU regional water system operates with an annual refill and drawdown cycle of its water supply storage reservoirs. Highly unusual weather events affect this cycle and can cause potential shortages. This can manifest in one or more of the following ways: Less than normal winter snow pack: limits the volume of instream flows available from snowmelt in the spring to fill Seattle's storage reservoirs for peak season demands.
- Unusually warm spring weather: causes early melting of the snow pack that results in early draw-down of the mountain reservoirs.
- Unusually warm and dry summer weather: significantly increases peak season demands and creates low flow conditions in streams tributary to the main-stem rivers.
- Delayed return of the fall rains or a dry winter: delays the fall reservoir refill cycle and creates extended low flow conditions in the streams and rivers.
- The specific cause and timing of any supply disruption will affect the direction, level, and timing of SPU's and/or BUD's response. One critical consideration in managing water supply and demand when there is a potential water shortage is stream flow levels. In addition to meeting the needs of SPU's retail and wholesale customers, the Cedar and South Fork Tolt rivers are managed to meet instream flow needs for fish and wildlife habitat. Water is released from SPU's regional storage reservoirs to augment and provide adequate instream flows for salmon and other species downstream particularly during periods of weather-induced low stream flow conditions and drought. Additionally, the Cedar River provides approximately half of the inflow tributary to Lake Washington on an annual average basis. The U.S. Army Corps of Engineers manages Lake Washington lake levels as part of its Lake Washington Ship Canal Project, which connects Lake Washington to Puget Sound. Their management objectives include providing water flows at the Hiram Chittenden Locks for navigation, fish passage, and control of the salt water intrusion caused by operation of the Locks.

STRATEGY

SPU's strategy for managing a drought and potential regional water shortage involves several components:

Information

Forecasting

Communication

Dynamic operating rules

Information - To deal with hydrologic uncertainty in real-time and in long-term planning horizons, SPU's water management team uses a number of available informational and data gathering sources. SPU contracts with the U.S. Geological Survey (USGS) to provide stream flow monitoring and data collection services.

Strategic placement of USGS stream gauging stations provides real-time information for understanding the hydrologic state of the water supply and river systems. SPU also contracts with the Natural Resources Conservation Service (NRCS) to provide snow monitoring and data collection services. SPU's regional water supply relies heavily on the water stored as snow in its mountain watersheds. Quantifying the snow conditions in our watersheds is an important activity during the winter and spring months as reservoir management and downstream flow release decisions are made.

Forecasting - Through the National Oceanic and Atmospheric Administration (NOAA), SPU regularly monitors daily weather forecasts (National Weather Service Seattle Forecasting Office), mid-range weather forecasts (Climate Prediction Center), 30- and 90-day and multi-season climate outlooks (Climate Prediction Center), and daily hydro-meteorological forecasts (Northwest River Forecast Center in Portland, Oregon). The internet has greatly improved access to these sources of information. For example, NOAA's El Niño Theme Page on the internet provides a wealth of timely information on current and forecasted El Niño and La Niña conditions with enough lead time for water resource managers to prepare for such events. SPU uses a number of analytical tools for forecasting hydrologic conditions as they relate to water supply and fisheries including: Stream flow forecasts prepared by the USGS and NRCS; Weather, climate, and river forecasts from NOAA; A reservoir management and stream flow forecasting computer model known as the Seattle Forecast Model, or SEAFM. This model is regularly updated with hourly meteorological and hydrological data, and it simulates the current state of the watershed (including snow pack, soil moisture, aquifer storage, and stream flows) and water supply system. The model is used to analyze and assess various future reservoir operating scenarios, both in real time and in near and long-term operational planning, based on probabilistic analysis of over 65 years of historic weather; and

Seattle Water Allocation Network (SWAN) model and the Conjunctive Use Evaluation (CUE) model, which are weekly time step simulation models used for calculating and evaluating the firm yield and reliability of Seattle's water supply system and potential future water supply projects. While not forecast tools, per se, these models provide valuable insight into the hydrologic record.

Communication - SPU's water management team works closely with members of other local, state, federal and tribal resource agencies including Seattle City Light, City of Renton, King County, Washington State Department of Ecology, Washington State Department of Fish and Wildlife, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Marine Fisheries Services, Muckleshoot Indian Tribe, and Tulalip Tribes. Agency conference calls are typically scheduled once a month to discuss hydrologic conditions, facility and system operations (water supply, hydropower, and Ship Canal), fish biology and ecology, and other subjects as may be beneficial in implementing instream flow plans for the lower Cedar and the South Fork Tolt rivers. When needed, such as during a drought, these conference calls occur more frequently.

SPU has ongoing formal and informal agreements with resource agencies, Indian Tribes, and the U.S. Army Corps of Engineers in how it manages the stream flow levels. These formal and informal agreements affect SPU's ability to manage the water supply when there is a potential shortage, as the needs of customers must be balanced with the needs of fish. Both the Tolt FERC Settlement Agreement and the Instream Flow Agreement for the Cedar River include management provisions and requirements for situations in which normal instream flows cannot be maintained.

Dynamic Operating Rules - Operational flexibility is key, with operating plans changing as conditions and forecasts change. Dynamic reservoir rule curves must be used since these can better reflect watershed conditions and allow risk and uncertainty to be managed. A key assumption is that abundance, shortage, and risk must be shared among all beneficiaries of the region's water resources. For example, critical minimum instream flow levels at locations specified in the Tolt and Cedar agreements referenced above are resorted to only after human water consumption is curtailed. All of the tools, information sources, and communications outlined above are needed for coordinating and decision making related to real-time operations.

REGIONAL DROUGHT EXPERIENCES

The SPU's regional water system (and BUD) has experienced two very different types of droughts in recent history. In 1987, storage reservoirs were at normal levels on June 1, but the summer weather was unusually warm and dry. Higher than normal outdoor water use accelerated the draw-down of the storage reservoirs. To reduce demand, in early August lawn watering was restricted to no more than once every three days

and customers were urged to voluntarily curtail other water uses. These actions reduced demand by approximately 10 percent. In early fall, an emergency pumping station was installed at the Chester Morse Lake reservoir to pump “dead storage” should the reservoir level fall below the lake’s natural outlet. Throughout the fall, precipitation continued below normal. The water supply system was managed and adjusted to obtain the maximum supply available (e.g., relying on Lake Youngs more than normal). In November and January 1988, the Chester Morse reservoir was low enough to require pumping and it wasn’t until February 1988 that precipitation returned to normal and began refilling the storage reservoirs.

In 1992, the system experienced a different type of drought. The winter was unusually warm, and snow pack and instream flows into the storage reservoirs were at record low levels. In late February it was evident that there was insufficient snow pack to fill the storage reservoirs and that the likelihood of recovery by June 1 due to rainfall was minimal. A number of measures were taken to maximize available supply (e.g., reducing system flushing, adjusting stream flow levels, etc) and to reduce demand.

In May, a number of mandatory water use restrictions were implemented in the SPU regional service area (including BUD). Mandatory restrictions, including a ban on lawn watering, resulted in an average regional consumption reduction of 25 to 30 percent below normal throughout the summer. In BUD’s service area, average consumption decreased between 35 and 45 percent during the summer. Tribes, state resource agencies, and the Army Corps of Engineers played a significant role in cooperating to maximize available water supply. In addition, other measures were taken by SPU to increase available supply, including initiating an intertie with Renton and accelerating the construction of a second pump plant for the Chester Morse Reservoir. The mandatory restrictions were rescinded in September as supply levels returned to normal with the onset of fall rains.

In 1997-98, one of the most significant El Nino weather events on record concerned SPU and its wholesale water purveyors regarding potential effects of this winter-warming phenomenon on snow pack, and consequently on water supply. SPU, together with BUD, SPU’s other wholesale customers, and other stakeholders revisited the RWSCP to ensure readiness in case of significant El Nino effects and took initial steps to prepare. Though a water shortage did not occur, this event resulted in several changes being made to the RWSCP and to BUD’s WSCP. Based upon experiences from the three water shortages, the following principles have been developed and incorporated into SPU’s RWSCP and BUD’s WSCP. These principles are articulated as follows: Given clear, timely, and specific information on supply conditions and the necessary actions to forestall worsening conditions, customers prefer the opportunity to meet targeted demand reduction levels through voluntary compliance measures. The decision to move to mandatory restrictions is more acceptable if the voluntary approach has been tried first but has not resulted in enough demand reduction to ensure public health, safety, and adequate stream flows through the projected duration of the shortage.

Each drought or other shortage situation has enough unique characteristics that a plan cannot specifically define all the scenarios and specific supply and demand management actions that may be needed or implemented. The usefulness of a WSCP lies in planning the range of supply and demand management actions in advance of the situation, and in defining the communication mechanisms by which decisions will be made during the event.

Given the effective conservation programs operated by SPU, BUD and other purveyors in the region since 1990, it is important to distinguish between curtailment and conservation. Conservation measures focus on long-term and lasting efficiencies that do not affect the quality of life. Curtailment measures focus on short-term, temporary actions that may impact quality of life.

It is essential to closely monitor water quality during a supply disruption, particularly during a warm weather drought. Water quality issues must be considered when supply management decisions are made.

ALTERNATIVE WATER SUPPLIES

Depending on the nature and timing of a potential water shortage, the following alternative water supplies may be useful to supplement existing supplies:

Interties - Since water supply disruptions will not affect all water suppliers to the same extent, it is sometimes feasible for SPU and/or BUD to obtain water from other providers through interties, where they exist.

Chester Morse Lake “Dead Storage” - SPU’s primary storage reservoir has a natural, gravity-fed outlet. When inflows are low the reservoir can fall below the natural rim but still contain a substantial amount of high quality water. In 1992 SPU installed emergency pump stations to pump the water over the natural outlet and into

the river, thereby augmenting both instream flows and water availability for customer use had the drought continued into fall or beyond. In granting the water right for this use, the Department of Ecology conditioned it with the following language:

“...Use of the temporary pumping plants is allowed only during water shortages due to unusual or extreme conditions and after the Seattle Water Department [ed. note: SPU] is implementing elements of its Water Shortage Contingency Plan . . .”

Reclaimed water - Using highly treated effluent instead of potable water for irrigation, street washing, construction purposes, etc. can reduce demand for potable water and lessen the impact of the shortage on the community. While high quality reclaimed water can be produced by King County at one or more of its wastewater treatment plants, issues include obtaining permits to use this water and obtaining and distributing adequate amounts to decrease potable water demands. These issues – availability, permitting, and distribution – are likely to change in future years and should be revisited in the event of any future water shortage.

SECTION 3 (PHASED CURTAILMENT PLAN)

STAGES OF PHASED CURTAILMENT

The WSCP provides four stages of response, which increase in severity as progressively more serious conditions warrant. This type of staged response would be appropriate to a regional summer drought or other long range disruption, and would in nearly all instances be coordinated with the RWSCP. Each of the four stages includes a variety of communications, internal operations, and supply and demand management strategies as appropriate. The stages are characterized as follows:

Advisory Stage - The public is informed as early as meaningful data is available that the potential for a future water shortage exists.

Voluntary Stage - If supply conditions worsen, the Plan moves to the Voluntary Stage, which relies on the voluntary cooperation and support of customers to meet targeted demand reduction goals. During this stage, specific voluntary actions are suggested for both residential and commercial customers. Surcharges may also be implemented.

Mandatory Stage – If the Voluntary Stage does not result in the reduction needed, or supply conditions worsen, the Mandatory Stage prohibits or restricts certain water uses. This stage would be accompanied by an enforcement plan that could include fines for repeated violations. Surcharges may also be implemented.

Emergency Curtailment Stage – The Emergency Curtailment Stage addresses the most severe need for demand reduction. This stage could include an extensive combination of severe water use restrictions, prohibitions, and rate surcharges. This would be used as the last stage of a progressive situation, such as a drought of increasing severity, or to address an immediate crisis, such as a system failure.

Recommendations about implementing the RWSCP would be made to the SPU Director by the SPU Shortage Advisory Group (hereafter SPUSAG; see Appendix “A”). This group, involving SPU department staff and purveyor representatives, will consider the following factors in making its recommendations:

- Total supply availability, including groundwater, interties, and modified instream flow releases.
- The rate of decline in total reservoir storage compared with the normal operating rule curve.
- Short and long-term weather forecasts by the NOAA National Weather Service
- Computer modeling of stream flow, weather, and demand assumption data
- The trends and forecasts of the system’s daily water demands
- The estimated margin of safety provided by the demand reduction, compared with the level of risk assumed if no action is taken
- The value of lost water sales revenue compared with the increased margin of reliability
- Consultation with elected officials, purveyor representatives, state resource agencies, the Army Corps of Engineers, and Tribes
- The length of time between stage changes (abrupt starts and stops are to be avoided), and required time to shift administrative gears and prepare to implement progressive stages of phased curtailment.
- Current events
- Customer response

BUD would implement its WSCP when it is notified by SPU that the RWSCP is being implemented, or at

such time that a local emergency requires implementation of the WSCP at the local level as determined by the BUD-WST.

1. ADVISORY STAGE

OBJECTIVES

To prepare BUD, the City or Bellevue, relevant agencies, and water customers for a potential water shortage thereby allowing all parties adequate planning and coordination time.

To undertake supply management actions in cooperation with SPU that forestall or minimize the need later for more stringent demand or supply management actions.

TRIGGERS

There are a variety of weather and other conditions that may cause concern about water availability and a potential water shortage. Two primary conditions that would trigger regional implementation of the Advisory Stage by SPU, BUD, and other SPU purveyors, are:

Total reservoir storage is not projected to be at standard operating capacity as of June 1, due to exceptionally low snow pack, precipitation, and/or lack of carryover storage from previous year;

Total reservoir storage and predicted inflows are significantly below historical norms for the current time of year, and supply modeling indicates that expected demands may not be met if this trend continues or worsens.

The Advisory Stage is withdrawn when projected reservoir storage trends improve to normal water supply conditions.

PUBLIC MESSAGE

“The potential exists for lower than normal water supply. Conditions may return to normal; however, if water supply conditions do not improve, we may need to reduce consumption at a later date. We’ll continue to keep you informed.”

ADVISORY STAGE ACTIONS

- SPU & SPUSAG COMMUNICATION ACTIONS
- Brief Purveyors on water shortage advisory and implementation of the Advisory Stage of the RWSCP.
- Provide regional public information regarding supply conditions and potential for a water shortage.
- BUD COMMUNICATION ACTION
- Convene and brief BUD-WST (Appendix A)
- Brief City Leadership Team, Emergency Preparedness Manager, and Public Information Officer (Appendix B)
- Brief elected officials (Appendix B)
- Brief Environmental Services Commission (see Appendix B)
- Brief City Employees (Appendix B)
- Provide Advisory Stage information to all BUD administrative staff, Utility Billing account representatives, and City Information Desk.
- Provide local support of SPU’s public information and education efforts about the water supply system, particularly concerning relationship of weather to supply and demand. Provide up to date local water use data and demand implications, as known. Coordinate with SPU to provide SPU Water Supply Status Report information to entities with special interests (Appendix “C” e.g., large water users, especially landscape and nursery industry, parks, major water using industries)
- Coordinate preparation and distribution of public information materials, explaining the WSCP stages and range of actions with Seattle Public Utilities; prepare “Question and Answers” for people planning new landscaping.

BUD INTERNAL OPERATING ACTIONS

- Intensify data collection actions (local water consumption, regional supply status) and monitoring weather and SPU supply forecasts.
- Increase monitoring of purveyor “hotline”, a frequently updated recording providing latest information and supply and demand data.
- Assess scheduled water main flushing and reservoir cleaning activities. Be consistent with regional decision to either accelerate so they are completed prior to the peak season or to reduce activities to conserve supply.

- Assess water quality in reservoirs and distribution system to target for correction areas predicted to experience severe degradation due to reduced consumption.
- Initiate planning and preparation for Voluntary Stage actions.

BUD SUPPLY AND DEMAND MANAGEMENT ACTIONS

None in the Advisory Stage

2. VOLUNTARY STAGE

OBJECTIVES

- Maintain or reduce demand to targeted demand reduction goals through voluntary actions by customers.
- Forestall or minimize need later for more stringent demand or supply management actions.
- Minimize the disruption to customers’ lives and businesses while meeting targeted demand reduction goals.
- Maintain high water quality standards throughout the water shortage.

TRIGGERS

The “Voluntary Stage” is implemented when one or both of the following factors applies:

- Supply conditions identified in the Advisory Stage have not improved or have worsened.
- Demand levels indicate the need for a more systematic response to manage the situation.

The SPU regional water system and BUD’s local water system are designed to carry large capacities of water during the summer peak months. Significantly lowered water demand during a drought, coupled with higher summer temperatures, increases the potential for water quality problems. Consideration will be given to potential water quality issues in defining the supply and demand management strategies at the regional level by SPU and at the local level by BUD.

PUBLIC MESSAGE

“We are relying on the support and cooperation of all water users to conserve the available water supply. Demand needs to be reduced by ____% (to be determined). Customers are responsible for determining how they will meet this goal. Water waste is not allowed. If everyone cooperates, we may avoid imposing more stringent restrictions at a later date. In addition to meeting the essential water needs of customers, meeting the needs of fish and other environmental concerns is a priority.”

3. VOLUNTARY STAGE ACTIONS

SPU & SPUSAG ACTIONS

SPUSAG will meet frequently to re-evaluate the water supply situation based on current and projected supply conditions, weather forecasts, and the season to determine appropriate actions and strategies. The group will determine target consumption goals to be achieved on a voluntary basis, which may be revised as necessary, and will advise Purveyors (Appendix D) regarding targeted goals for consumption reductions. Based on the consumption goal, some or all of the Voluntary Measures (Appendix E) will be requested. SPU and SPUSAG will:

- Establish systematic communications with Seattle elected officials; SPU Director and SPUSAG communicates the Voluntary Stage Demand Reduction Goals, the nature and scope of voluntary measures, and the voluntary curtailment strategy to the Seattle Mayor and Council, purveyors, tribes, and resource agencies.
- Evaluate whether targeted consumption levels and supply conditions warrant a rate surcharge to reinforce voluntary actions and/or to recover revenue losses. SPU Director makes recommendation to Mayor and Council.
- SPUSAG informs Purveyors of move into Voluntary Stage and of any surcharges.

BUD COMMUNICATION ACTIONS

- Establish systematic communications with Mayor and City Council; City Leadership Team, Emergency Preparedness Officer, and City Public Information Officer; Environmental Services Commission; and, City employees (Appendix B).
- Concurrent with SPU actions, prepare Declaration of Shortage Water Emergency for the City Manager to sign and public notice materials for appropriate local media.
- Prepare Mandatory Water Use Restrictions and/or Surcharges for BUD Director’s consideration and approval.

- Request that highly visible City Departments (e.g. Utilities, Transportation, and Parks) set a public example by doing more than the minimum voluntary actions. Request curtailment plan from Parks.
- Establish systematic communication to keep BUD staff (especially phone coverage staff), Utility Billing representatives, O&M staff, and City Information Desk up to date on goals, conditions, and actions.
- Consult with local customer groups to target public information messages and materials, and to obtain feedback on utility actions (Appendix C).
- As appropriate, support SPU's regional public information, media, and advertising campaigns and supplement through Bellevue's local outreach communication channels:
- Establish routine timing for press releases that provide current status and outlook; present information in standardized format that becomes familiar to local media and public.
- Publish and promote regional consumption graph that displays the goal and previous 24 hour consumption in local newspapers.
- Promote consumption goals for typical households, and a percentage reduction goal for commercial customers.
- Support development and implementation of regional and local communications and marketing plans promoting voluntary curtailment, including paid advertising to inform customers about supply and demand conditions; recommends customer actions to reduce demand sufficiently (per Appendix E). Depending on conditions, reminds customers that if goals are not achieved, restrictions may be necessary.
- Include water quality information in public information so that if flushing is necessary, the public understands that it is essential for water quality maintenance.
- Publicize the water supply conditions on BTV and Department web page (with regular updates). Ensure information provided covers the needs of all key stakeholders: the public, news media, and purveyors.
- Identify and promote reduced evapotranspiration (ET) rate for large irrigators.
- Establish a "BUD Water Shortage Hotline" for customers to obtain additional conservation information.
- Contact largest customers to request percentage reduction. Contact other City Departments and public agencies to inform them of conditions and request their cooperation.
- Prepare list of and promote commercial car wash facilities that recycle water.
- Print generic postcards to acknowledge receipt of customer correspondence regarding the shortage and to inform customer that specific response is being prepared.

BUD INTERNAL OPERATING ACTIONS

- Continue actions listed in the Advisory Stage
- Eliminate system operation water uses determined not to be essential to maintain water quality such as pipeline flushing; complete cleaning of any in-town reservoirs known to be vulnerable to warm weather taste and odor concerns.
- Increase water quality monitoring actions.
- Implement staff reassignments as needed.
- Identify the potential "next steps needed to reduce demand" including timing, what type of restrictions, and/or surcharges to be imposed.
- Initiate remaining planning and preparation for Mandatory Stage, including staffing changes that may be needed for the Mandatory Stage to enforce mandatory restrictions.

BUD SUPPLY AND DEMAND MANAGEMENT ACTIONS

- Request that non-recirculating fountains be turned off (Appendix C).
- Request that Fire Department limit training exercises that use water.
- Request that the City, Bellevue School District, and other large fleet agencies eliminate washing fleet vehicles unless recycling car washes are used.
- Request that water washing of City sidewalks, driveways, parking lots, etc. be limited to situations that require it for public health and safety.
- Have BUD field personnel "tag" observed obvious water waste, such as hoses without shutoff nozzles, gutter flooding, etc. with notice that informs customer about the supply conditions and need to conserve.
- Together with SPU, evaluate ability to accelerate, enhance, or expand long-term conservation programs; implement as appropriate.

4. MANDATORY STAGE

OBJECTIVES

- Achieve targeted demand reduction goals by restricting or prohibiting defined water uses.
- Ensure adequate water supply will be available during the duration of the water shortage to protect public health and safety, and to balance the need for stream flows for fish habitat.
- Minimize disruption to customers’ lives and businesses, to the extent practical, while meeting target demand reduction goals.
- Maintain high water quality standards throughout the shortage.
- Promote equity amongst customers by establishing clear restrictions that affect all customers.

TRIGGERS

- Progression to the Mandatory Stage occurs when:
- Goals established in the “Voluntary Stage” have not been met, and additional action is needed.
- Supply conditions worsen despite voluntary measures.
- Specific restrictions imposed during the mandatory stage would be determined based on the season of the year, targeted demand reduction goals, and other considerations previously mentioned. Variations of specific restrictions may be applied based on water supply conditions. For example, lawn watering restrictions may simply consist of time of day restrictions; or if conditions warrant, lawn watering could be restricted to certain times of day and allowed only once a week; or lawn watering could be entirely restricted.

PUBLIC MESSAGE

“It is necessary to impose mandatory restrictions to reduce demand because the voluntary approach has not resulted in the necessary savings (or supply conditions have worsened despite the public’s best efforts). We are continuing to rely on the support and cooperation of the public to comply with these restrictions but need the certainty and predictability of restricting certain water uses to ensure that throughout the duration of this shortage an adequate supply of water is maintained for public health and safety.

MANDATORY STAGE ACTIONS

- SPU & SPUSAG COMMUNICATION ACTIONS
- SPUSAG recommends nature, scope, and timing of restrictions to SPU’s Director. SPU’s Director of Water Quality and Supply determines that water supply and demand management strategies will not result in unacceptable water quality degradation. SPU’s Director recommends Mandatory Stage and water use restrictions to the Seattle Mayor and City Council. Seattle City Council adopts legislation on mandatory restrictions and, if needed and not already in place, emergency surcharges.
- The SPUSAG informs Purveyors of implementation of the Mandatory Stage; the nature, scope and timing of mandatory restrictions; and of emergency surcharges if implemented.

BUD COMMUNICATION ACTIONS

- Brief Mayor and City Council; Leadership Team, City Emergency Preparedness Manager, and City Public Information Officer; Environmental Services Commission; and City employees (Appendix B) regarding water shortage status, the move into the Mandatory Stage, and water restrictions, and /or surcharges if implemented.
- Concurrent with SPU actions, prepare Declaration of Water Shortage Emergency for the City Manager to sign and public notice materials for appropriate local media.
- Prepare Mandatory Water Use Restrictions and /or Surcharges for BUD Director’s consideration and approval. Request that highly visible City Departments (e.g. Utilities, Transportation, and Parks) set strong public example and do more than meet minimum water use restrictions. Request curtailment plan from Parks.
- Inform public about the nature and scope of the mandatory restrictions through a press conference, paid advertising and other means, including direct mail. Information will address enforcement mechanisms, rate surcharges, target consumption goals, projected duration of restrictions, and reasons for imposing restrictions, the possible consequences if targeted demand reduction goals are not met. Exemptions from restrictions, if any, will be clearly identified.
- In communicating mandatory restrictions to the public, a clear distinction will be made between lawn/ turf watering and watering gardens and ornamental plantings. The type and amount of watering al-

lowed will be clearly defined.

- The BUD “Water Shortage Hotline” will be set up to receive reports of violations of restrictions.
- Customers who irrigate with private wells will be urged to install signs to let the public know that private well water is being used.
- Communication actions from the Advisory and Voluntary stages will be continued and enhanced.

BUD INTERNAL OPERATING ACTIONS

- Continue appropriate actions from previous stages.
- If appropriate implement procedures for exemptions from restrictions and/or emergency surcharges.
- Implement Enforcement Procedures for Mandatory Water Use Restrictions, including highly visible “Water Watchers” (Appendix “F”).
- Increase water quality monitoring actions.
- Begin plans and preparations to move into the Emergency Curtailment Stage, including staffing re-assignments and mobilization of the EOC & EOB.

BUD SUPPLY AND DEMAND MANAGEMENT ACTIONS

- Overall supply conditions will be considered by SPUSAG and BUD-WST to determine specific restrictions to impose. Some, but not all, options for water use restrictions, depending upon how much demand reduction is necessary to maintain essential water service levels for public health and safety, are listed below.
- Prohibit use of any ornamental fountain using drinking water for operation or make-up.
- Prohibit car washing except at commercial car wash facilities that recycle water.
- Rescind all Hydrant Use Permits.
- Prohibit washing of sidewalks, streets, decks or driveways except as necessary for public health and safety.
- Limit pressure-washing of buildings to situations that require it as part of scheduled building rehabilitation project (e.g., painting), or prohibit entirely if necessary.
- Prohibit water waste including untended hoses without shut-off nozzles, obvious leaks, and water running to waste such as gutter flooding and sprinklers or irrigation systems whose spray pattern unnecessarily and significantly hits paved areas.
- Prohibit all landscape and garden watering during the warmest hours of the day. For example: No Watering Between 10:00 a.m. and 7:00 p.m.
- Limit all landscape and garden watering to a specific number of days per week or per month. This option will depend on target consumption goals, the time of year, the extent to which watering is occurring, and how much demands have already decreased. For example, if demand has already been reduced by 15% through other measures, during July and August limiting turf watering to two days a week on a region-wide basis would further reduce average daily demand by approximately 15 million gallons. Limiting lawn or turf watering to one day a week will yield an additional average daily reduction of 15 to 20 million gallons. (These figures are based on experience during 1992.)
- Prohibit/ban lawn watering with other watering restricted. For example, no landscape or garden watering between 10:00 a.m. and 7:00 p.m. Newly installed lawns may be exempted from this ban if the procedures listed below are followed. If exemptions are granted, it is with the understanding that if supply conditions deteriorate, before moving to the Emergency Curtailment Stage, lawn watering will be banned and exemptions will be rescinded.

EXEMPTIONS FROM WATER USE RESTRICTIONS

- Lawn watering exemption - Newly installed lawns may be exempted from restrictions if the procedures listed below are followed. Customers wishing to use this exemption need to contact BUD as directed in advance of the exemption being granted, and provide their name, address, phone number, size of lawn and type of watering system. This information will be used to quantify the amount of water allowed under this exemption and to spot check for compliance. The procedures and requirements to obtain a New Lawn Watering Exemption (subject to change) are:
- Upon request, applicant will be provided a packet that includes the New Lawn Watering Exemption requirements and the required application and certification forms for the exemption.
- New lawn owner must apply to BUD for a New Lawn Watering Restriction Exemption. The Exemption

Application Form shall be provided by BUD, and the applicant shall include the following information in making application for the exemption:

- Property owner' name, address, and phone number. Name, address, and phone number of local contact if different than property owner.
- Address of property the exemption is being requested for.
- Drawing of the turf area the exemption is being requested for that shows the turf shape, and that provides the actual square footage and approximate dimensions of the turf area.
- Form Certification signed by the property owner certifying that: a) the exemption is being requested for a new lawn as defined below; and b) required signage provided by BUD will be prominently displayed at all times; and c) that the soil was properly prepared as described below; and d) that watering guidelines provided by BUD will be followed; and e) that the City and BUD will be held harmless in the event the exemption is rescinded as discussed below.
- After BUD verifies that applicant meets requirements, an authorization packet will be mailed to the customer, including a sign to be visibly posted indicating that BUD Exemption Requirements are being complied with.
- New lawns must be properly installed, meaning that at a minimum two inches of organic soil amendment, such as composted yard waste, is cultivated into the top six inches of existing soil.
- New lawns must be watered according to guidelines provided by BUD in the packet mentioned above.
- For purposes of this exemption, "new lawn" shall be defined by the Water Utility Code.
- In the event that supply conditions deteriorate, before moving to the Emergency Curtailment Stage, lawn watering will be banned and exemptions will be rescinded. It will also be revoked on a case by case basis if the exemption requirements are violated by the customer granted the exemption or in the case of a water system emergency. Monitoring and enforcement are at the discretion of BUD.
- If exemptions are granted, it is with the understanding that if
- Customer will agree to hold BUD harmless for any and all loss resulting from rescinding of the Restriction Exemption for any reason.
- The existence of an exemption to a lawn watering ban would be announced as early in the water shortage response process as practical.
- See Appendix – H for referenced forms and certifications. Automatic irrigation system exemption - Users of automatic irrigation systems may be exempt from certain mandatory watering restrictions if specific requirements are met and followed – but not from a total watering ban. This exemption allows an alternate path to achieving equivalent water use reductions due to the precision that automatic irrigation systems can achieve. This exemption shall not be used as a loophole to avoid water use curtailment. Example: If only 30 minutes of lawn watering is allowed per week, automatic irrigation systems that meet specified criteria would be allowed to water based on a determined percentage of evapo-transpiration (ET), such as 50%, instead of the time-limit based restriction. [Note: ET is a factor calculated according to climatic data, which is commonly used for lawn watering in commercial applications. ET data would be made available on the SPU web page and /or from BUD and in alternate formats.] In the event of a total watering ban, these users would also be prohibited from watering (unless safety-base exemption is met)The procedures and requirements to obtain an Automatic Irrigation System Exemption (subject to change) are:
 - Upon request, applicant will be mailed a packet that includes the exemption requirements and the required application and certification forms for the Automatic Irrigation System exemption. Required information includes:
 - Irrigation system owner must apply to BUD for Automatic Irrigation System Exemption. The Exemption Application Form shall be provided by BUD, and the applicant shall include the following in making application for the exemption:
 - Name, address, and phone number of the property owner.
 - Address of property exemption is being requested for, and the name, address, and phone number of local contact responsible for operation of the irrigation system the exemption is being requested for.
 - Certification that irrigation system has been audited, and is:
 - Hydro-zoned (separate zones for turf and planter areas).

- At least 62.5% efficient as defined by the Irrigation Association, including both system distribution uniformity and management practices.
- System efficiency rating must result from an actual audit of the system performed and certified by an Irrigation Association Certified Irrigation System Auditor. The Auditor's name, address, and phone number must also be provided. Equipped with a functioning rain shut-off device.
- Audit was conducted within 12 months prior to the request for the exemption.

A list of Irrigation Association certified Irrigation System Auditors will be maintained and available from BUD and/or SPU. Certification form to be used shall be provided by BUD.

A Baseline Irrigation Schedule for the landscape based upon historical ET and hydrozones water needs must be provided to BUD and the local system operator. This schedule will be used to monitor conformance with Exemption Requirements. Schedule form to be used shall be provided by BUD.

Irrigation system owner and operator must agree to adjust Baseline Irrigation Schedule for the system on a weekly basis according to current ET data. Watering limitations stipulated by BUD would need to be followed. The limitations would be stated as a percent of ET. For example, users who meet the above requirements would be able to water based on 50% of ET (specific percent amount decided at the time the restriction is announced depending on the supply outlook). The SPU website (www.ci.seattle.wa.us/util/rescons/conserv.htm) and the City of Bellevue's government television station (BTV Channel 55) would be regularly updated to provide the information needed for those watering according to this exemption. The information would be available through other means as well. Time of day restrictions, such as watering between 10:00 a.m. and 7:00 p.m. must be followed.

In the event that supply conditions deteriorate, before moving to the Emergency Curtailment Stage, lawn watering will be banned and exemptions will be rescinded. It would also be revoked on a case by case basis if the rules stated above are violated by the customer granted the exemption, or in the case of a water system emergency. Monitoring and enforcement are at the discretion of BUD. Customer will agree to hold BUD harmless for any and all loss resulting from rescinding of the Restriction Exemption for any reason.

See Appendix – H for required forms, certifications, and schedules. Other exemptions - For purposes of dust control, water may be applied to construction areas or other areas needing to comply with air quality requirements. If available and feasible, reclaimed water will be promoted or required for dust control in-lieu of the public water supply.

Ball fields and playfields may be watered at the minimum rate necessary for dust control and safety purposes. BUD will exempt customers with special medical needs, such as home dialysis, from any emergency surcharge, provided individual customers notify the utility of such a need.

See Appendix – H for required forms and certifications.

EMERGENCY CURTAILMENT STAGE (OBJECTIVES)

Achieve immediate and significant demand reduction goals to maintain adequate water supply essential for basic public health and safety.

TRIGGERS

SPU and/or BUD recognize that:

- A critical regional and/or local water supply emergency exists.
- Immediate and significant curtailment actions are necessary to maintain essential supplies of water for public health and safety.

PUBLIC MESSAGE

To be determined based upon conditions of the emergency. Basic elements of message are: "A water supply emergency exists. Severe restrictions on water use are necessary to maintain adequate water supply essential for basic public health and safety. The public's continued cooperation is requested. Restrictions will be strenuously enforced.

EMERGENCY CURTAILMENT STAGE ACTIONS

No prior emergency in the SPU regional water system or BUD local water system history fits this description. This stage is characterized by two basic approaches. First, stringent and potentially severe water use restric-

tions are established and enforced. Secondly, significant rate surcharges are used to encourage customer compliance. While a rate surcharge may be implemented in either the Voluntary or Mandatory stages, a surcharge is a key component to the success of this stage, and previous surcharges may be increased if appropriate.

SPU & SPUSAG COMMUNICATION ACTIONS

- Continue all previous, applicable actions.
- Prepares appropriate legislation and recommends Declaration of Emergency to Seattle Mayor and City Council for consideration and approval.
- Informs Purveyors of move into Emergency Curtailment, and of determined water use restrictions, prohibitions, rationing allotments, and/or further surcharges.

BUD COMMUNICATION ACTIONS

- Continue all previous, applicable actions.
- Brief Mayor and City Council; Leadership Team, City Emergency Preparedness Manager, and City Public Information Officer; Environmental Services Commission; and, City employees (Appendix B) regarding water shortage status, the move into the Emergency Curtailment Stage, and water restrictions, prohibitions, and surcharges.
- If not done previously, and, if applicable, concurrent with SPU actions, prepare Declaration of Water Shortage Emergency for the City Manager to sign and public notice materials for appropriate local media.
- Prepare Emergency Curtailment Water Use Restrictions, Prohibitions, and Surcharge legislation for Council consideration and approval.
- If applicable, coordinate with SPU as appropriate to define the problem to the public as an emergency.
- Inform customers of the rate surcharge and how it will affect them. Provide information on an appeal process.
- Coordinate with Emergency Preparedness Manager for appropriate implementation of the EOB, EOC, and City Emergency Response Plan.
- Through EOC, coordinate with Police, Fire, and other City departments for assistance in enforcing prohibition of water waste and other response activities as determined.
- Inform customers that taste and odor water quality problems may occur with system-wide reduced water consumption.
- Inform customers about possible pressure reductions and problems this may entail.
- Define and communicate exemptions for medical facilities and other public health situations.

BUD INTERNAL OPERATING ACTIONS

- Continue and/or enhance all appropriate actions listed in prior stages.
- Continue and enhance "Water Watcher" patrols.
- Curtail fire line testing unless it can be shown to be essential to protect the immediate public health and safety.
- Coordinate with SPU to further enhance water quality monitoring actions.

BUD SUPPLY AND DEMAND MANAGEMENT ACTIONS

- Implement water use restrictions and/or prohibitions per SPUSAG and/or BUDWST recommendations and Council approval, including but not limited to:
 - All lawn and turf irrigation prohibited. Lawn Watering and Irrigation System Exemptions previously issued are repealed.
 - If feasible make reclaimed water available to tanker trucks for street cleaning, construction projects, landscape irrigation, dust control, etc.
 - Require that all fire fighting agencies discontinue the use of water in training exercises until emergency is over.
 - Rescind all Hydrant Use Permits.
 - Require local parks departments to close down any outdoor pools.

SECTION 4 (SHORT TERM EMERGENCY CURTAILMENT PLAN

INTRODUCTION

Many of the demand reduction measures employed in response to a Short Term Emergency are the same used during a progressive, weather-related shortage. However, short term emergencies are unique because of a lack of preparation time and the urgency of immediate, large-scale demand reductions. Each emergency scenario is different, but most would require major curtailment actions by customers. Further, unlike drought induced water shortages, some emergencies can be localized, requiring demand reduction for only a limited geographic area.

Strategies for dealing with emergencies have been developed based on lessons learned from previous water utility events, other utility experiences, and a sorting of measures based on specific criteria. In order to provide a frame of reference for future emergency situations, a short discussion of recent water supply emergencies is provided.

BACKGROUND AND EXPERIENCE WITH EMERGENCY DEMAND REDUCTION

Between 1987 and 1990, the SPU regional water system experienced two pipeline failures and a major flood that caused short term water emergencies throughout the service area. In 1987 and 1988, different sections of the Tolt Pipeline broke, causing water shortages. In November 1990 torrential rains saturated much of Western Washington, causing flooding of the Cedar River and the closure of a primary water diversion facility and a water treatment plant. The supply of acceptable quality water was limited and stored water supplies were quickly depleted. These past experiences provide good examples of what can be expected during emergency water shortage situations.

1987 Tolt Pipeline Break: In November 1987, a section of the Tolt Pipeline in the Woodinville area experienced a major break near a joint in the 5.5 foot diameter supply pipeline. The pipeline break flooded a neighborhood near Woodinville, damaging several homes and temporarily leaving many residents without water. Approximately six million gallons of water were lost from the transmission line that runs between the Tolt River Regulating Basin and SPU's north end distribution system. At the time of the pipeline break, there was an estimated two-day supply of water for the 10,000 homes affected. Water distribution was then switched over to the Cedar River system to make up for lost supply. Although some customers were initially out of water for a short period of time, the combined effort of SPU's Water Supply and Operations staff and the Woodinville Water District helped restore water service and assure reliable water service during the repair period. During the event, customers were urged to cut back on water use until the repairs were complete. The public responded to the emergency conservation message by reducing consumption by 5% from 134 mgd to 128 mgd while the line was being repaired.

1988 Tolt Pipeline Break: In August 1988, another major break in the Tolt pipeline system occurred. This break occurred during the maintenance of a valve which closed too quickly, creating a high pressure surge that broke the supply pipeline. During the emergency event approximately 100 customer were threatened with loss of water service or experienced low water pressure. Water was immediately diverted from the Cedar system to serve the Eastside customers.

The break occurred in August, during the peak water use season. Immediate action was taken to alert customers that water use reductions were required to avoid additional water shortages. Through the media, customers were asked to curtail all nonessential water uses. The goal was to reduce water use by approximately 30 percent; however, only an 18 percent reduction was achieved.

1990 Cedar River Flood: In November 1990, heavy rains flooded many Western Washington rivers including Cedar River. Flooding exceeded the 100 year event and set new historic highs for precipitation. The Cedar River flooded, washing out huge amounts of soil and trees, resulting in a buildup of debris that threatened SPU's Landsburg diversion. The flooding, rain and wind raised turbidity levels at both the Tolt and Morse Lake reservoirs and at the Landsburg diversion to unacceptable levels. At one point, the turbidity on the Cedar River, which provides 70 percent of SPU's regional water supply, was 25 times higher than normal. The short-term water quality situation was determined to be fairly stable, but long-term supplies were in question. Critical storage-regulating facilities, such as Lake Youngs, were at or below minimum operating level. The high turbidity levels in drinking water supplies could not be filtered, as SPU had no filtration system and

treatment was limited to chlorination, fluoridation and corrosion control (since this event full filtration and advance treatment has been built and added on the South Fork Tolt River Supply, and advance treatment is under construction on the Cedar River Supply). After a week of restricted water supplies, water consumption decreased approximately 10 percent, or 13 mgd, due to public requests for emergency demand reductions. Throughout the three water shortage events, consistent conservation messages and information on appropriate demand reduction measures were delivered to water users through the media and by direct contact. Although demand reduction goals were not always met by water users, water use was curtailed enough in each instance to suffice and avoid more serious water supply shortages.

There are several criteria by which to decide which demand management measures are appropriate to initially reduce demand during an emergency:

- **Timing:** can the measure(s) or action(s) deliver the necessary savings in the necessary timeframe, e.g. are immediate savings needed or can the system support a gradual reduction in demand?
- **Magnitude of savings:** can the measure(s) or action(s) produce enough savings to make a meaningful difference, e.g. reduce demand to the level the impaired water system can handle?
- **Season:** can the measure(s) or action(s) make any impact at the time of year that the emergency occurs, e.g. will banning lawn watering have little impact in November?
- **Costs:** How severe are the cost implications of the measure(s) or action(s) to the customer, including local business and industry.

SUPPLY AND DEMAND MANAGEMENT DURING EMERGENCIES

No single strategy can be created which will meet the needs of the department for all emergency scenarios. The criteria listed above create a framework for decision making. Emergencies initially require quick and immediate response. Once an assessment is made as to how long it will take to restore the system, the immediate response strategy may change if it appears that the repair process will be lengthy.

The strategy for most emergencies is to focus on measures and actions that will have the most immediate and significant impact to reduce water use. In the event of a regional Short-Term Emergency all needed and available back up supplies would be activated by SPU and BUD: interties, well-fields, off-loading wholesale customers who have other sources, etc.

Appendix “G” presents a range of potential demand management savings. The range depends on factors including the season, weather conditions, how effectively and urgently the message is communicated, whether or not an emergency surcharge is included, etc.

SPU & SPUSAG ACTIONS

See **Phased Curtailment, Emergency Curtailment Stage.**

BUD COMMUNICATION ACTIONS

See **Phased Curtailment, Emergency Curtailment Stage.**

BUD INTERNAL OPERATION ACTIONS

See **Phased Curtailment, Emergency Curtailment Stage.**

BUD SUPPLY AND DEMAND MANAGEMENT ACTIONS

See **Phased Curtailment, Emergency Curtailment Stage.**

Appendices

Appendix – A

Water Shortage Response Teams

1. Bellevue Utilities Department – Water Shortage Team
 - BUD Management Team
 - Director & Deputy Director
 - Assistant Directors
 - Resource Conservation & DWQ Programs Manager
 - Sr. Resource Conservation Program Administrator
 - Department Public Information Officer
1. Seattle Public Utilities – Shortage Advisory Group

Appendices

- SPU Director
- SPU Director of Strategic Services
- SPU Director of Engineering
- SPU Director of Water Quality & Supply
- SPU Water Resources Manager
- SPU Water Conservation Manager
- Purveyors' Representative and Alternate

Appendix – B

Internal Communication Groups

1. Mayor & City Council
2. Environmental Services Commission
3. Leadership Team & City Management
 - City Manager and Deputy City Manager
 - Department Directors and Deputy Directors
 - Emergency Preparedness Manager (liaison to EOC/EOB)
 - City Public Information Officer
1. City Employees
2. BUD and City Administrative Assistants – Phone Coverage Staff
3. Neighborhood Liaisons

Appendix – C

Large Customers & Customer Groups

1. Wholesale Customer
2. Large Irrigators
3. Large Commercial and Industrial Customers
4. Hotels and Restaurants
5. Local Nurseries
6. Private Fountain Owners
7. Bellevue Chamber of Commerce
8. Bellevue Downtown Association
9. Bellevue School District
10. Bellevue Community College

Appendix – D

Seattle Public Utilities Wholesale Purveyors

Appendix – E

Voluntary Stage Measures

Residential Indoors

- Flush the toilet less often. Each flush uses 1.6 to 7 gallons of water depending on age of toilet.
- Use dish and clothes washing machines only when full. Top loading washers use 15 to 40 gallons per load. Front loading washing machines use approximately 30% less water than residential top loading models.
- Keep drinking water cold in the refrigerator rather than running the faucet until the water's cold.
- Take shorter showers; for every minute of reduced showering time, 2 1/2 to 5 gallons is saved.
- Don't let the faucet run while shaving, brushing teeth; when washing vegetables, use a pan or bowl of water instead of letting water run.
- Catch water while waiting for hot water for use on plants.

Residential Outdoor Use

- Wash cars less often; instead of using the hose consider a commercial car wash that recycles water.
- Always use shut-off nozzle on hoses for window washing, etc.

Landscape Measures - Commercial and Residential

- Water lawns and gardens only early in the morning or late in the evening to reduce evaporation.

- Consider letting established lawns go dormant until the shortage is over. Homes that normally water lawns will save from 25% to 50% by not watering lawns.
- If it is raining don't water lawns.
- Eliminate outdoor water play, i.e., running through the sprinkler, plastic water slides, wading/swimming pools that require frequent re-filling
- Eliminate all hosing of sidewalks, driveways, decks.
- Water established plants only when necessary: Probe into the soil to see if the root zone is dry. Mulch—from two to four inches—in planting beds will help retain moisture.
- Create “wells” around trees to minimize runoff when they are watered.
- If there is an automatic irrigation system have it audited to ensure that it is using water efficiently. Learn how to change the program that controls the system in order to cut back on irrigation time. Equip it with a rain sensor that will override the system during rainfall.

Commercial

- Set goals for reduced water use and inform employees. Give employees ideas for curtailing water use and ask them for theirs.
- Repair all leaks and dripping faucets. Urge employees to report leaks.
- Reduce or eliminate routine vehicle cleaning during shortage. Use local commercial car wash facility that recycles water.
- Ensure that all hoses are fitted with shut-off nozzles.
- Eliminate hosing used ice as a means to dispose of it.
- Eliminate all hosing of walkways, parking lots, loading docks. Pressure washers use substantially less water.
- Postpone routine building washing until after shortage
- Post signs informing customers of the nature of the water shortage and ask for cooperation in reducing water use
- Turn off all non-recirculating fountains. On windy days, where there is significant water loss, turn off all fountains
- Restaurants: provide water only on request
- Accelerate the update of restrooms by replacing older toilets with 1.6 gallon per flush models.
- Parks: limit wading pool hours to days that are forecasted to be 70 degrees or warmer (wading pools are generally emptied and refilled daily for public health reasons)

Appendix – F

Mandatory Stage Enforcement Procedures

- Determine number of warnings before fines applied;
- Self-duplicating “Notice of Violation” forms printed; one copy to leave at property, one to record violation with BUD.
- Staff with customer service and communication experience assigned to “Water Watch”
- Establish procedure for “Water Watchers” to record warnings and penalties on customer accounts
- Establish “hotline” for customers to complain about violations; to help avoid frivolous complaints, recorded message should note that only complaints with name and address recorded can be responded to
- Vehicles for “Water Watch” made available; vehicles that are signed as “Water Watchers” will increase visibility and effectiveness of enforcement
- High priority routes established, e.g., areas with large lawns
- All field and customer service staff provided “fact sheets”, Question and Answer sheets; briefed on restrictions, enforcement procedures; field staff trained on tagging obvious violations

Appendix – G

Curtailment Measures Potential Demand Reductions

Appendix – H

Appendices

Exemption Forms

- New Lawn Watering Exemption Application forms and certifications.
- Automatic Irrigation System Exemption Application forms, certifications, and schedules.
- Other Exemptions.

City of Bellevue

Parks & Community Services Department

2001 Water Shortage Response Plan

The Bellevue Parks & Community Services Department, in cooperation with the Bellevue Utilities Department, has adopted an aggressive, pro-active response plan to meet the demands of our current regional water shortage. The Parks 2001 Water Shortage Response Plan will not only meet all conservation goals, but should serve as an example to the community for others to follow. We encourage others to adopt similar procedures and conservation measures as they may apply. Together we can minimize impacts to our landscapes, and our lives, during these challenging times.

This water shortage response plan serves as our immediate response to the Voluntary Stage of phased curtailment of water consumption. It will reduce normal irrigation use by 50%. It allows us to protect our investment in expensive trees and shrubs, and the many benefits they provide, while dramatically reducing irrigation to turf areas.

This plan meets water conservation goals while still allowing select green spaces for the public to enjoy. It has built-in flexibility to ramp back irrigation consumption should the water crisis escalate or resume typical managed irrigation should regional supplies allow. The Parks & Community Services Department will work closely with our Utilities Department to monitor regional water supplies and respond to any changes that occur.

BACKGROUND FACTS:

- The City has had an active Water Conservation Program in place for nearly 15 years. It is an integral facet of our planning processes and our Renovation and Refurbishment Plan. Focus areas include:
 - ◇ Landscape planning and design
 - ◇ Implementation of effective cultural practices during installations
 - ◇ Modern irrigation system construction, replacement and management
 - ◇ Landscape management and maintenance practices
 - ◇ Water conservation measures applied in all buildings
- The Bellevue Parks & Community Services Department manages over 1,900 acres of public property. Only about 17% (330 acres) is irrigated by domestic water supply.
- Over 2/3 of the parklands are native forests and wetlands.

City of Bellevue

Parks & Community Services Department

2001 Parks Water Shortage Response Plan

The Parks & Community Services Department anticipates that the Voluntary Stage of the Utilities Water Shortage Response Plan will be implemented in early April as a result of the state-wide drought emergency. Accordingly the Parks & Community Services Department will manage the City's park resource system according to the following guidelines until such time that the Utilities Department determines that water supplies are adequate to resume additional parks irrigation. This plan is designed to provide flexibility to ramp parks irrigation up or down as the drought conditions become more or less severe.

Voluntary Stage:

- Irrigation systems will be activated and tested to ensure that systems are functioning correctly and that there are no breaks in underground lines that waste water. We encourage businesses and homeowners to do the same. Pipe joints can become weakened with time, and the recent earthquakes may have contributed to possible line failures. You may see irrigation systems around our park system operating during the day time. We will be testing and repairing systems during daylight hours.
- Irrigation systems will initially be scheduled to eliminate irrigation to turf areas on streetscapes, utility sites, and city parks except as described below. It is anticipated that these measures will reduce system wide water use by up to 50%. These measures will remain in effect until such time that an improved water supply forecast is available.
- Park turf areas will not be irrigated but for the following exceptions:
 - ◇ Reduced irrigation (90% of ET) at:
 - Inner circle of Downtown Park
 - 7 City Beach Parks
 - Robinswood Park – lawn between house and pond, Cabana lawn
 - Crossroads Park addition – new lawn area
 - Athletic fields – water just enough to keep safeShould it be necessary to setup conservation efforts, we would further reduce irrigation by an appropriate percentage of ET in balance with supply forecasts.
 - ◇ Golf courses – irrigate greens and tees; reduced irrigation (90% of ET) on fairways throughout season.
- Shrubs and trees will be irrigated by hand or with very efficient irrigation systems such as drip, bubbler, or computer controlled systems designed to separate turf areas from tree and shrub zones. Our goal is to keep plant material alive to protect the public's investment. Should it be necessary to step up conservation measures, we would next eliminate shrubbery irrigation (with the exception of the collections at the Bellevue Botanical Garden), then tree irrigation with the exception of survival watering manually or through appropriately zoned irrigation systems.
- Downtown Park water features: (All systems are recirculating)
 - ◇ Belvedere Fountain may be turned off
 - ◇ Canal may remain operating and would remain running in order to maintain water quality.
 - ◇ Waterfall operation may be reduced. It may run from 11 am to 1 pm and from 6 pm to 8pm.
 - ◇ Because the canal and waterfall are currently empty due to continuing drought emergency declared by the Governor, and a potentially severe summer water shortage, these features will not be refilled and placed in service until such time that a water supply forecast firmly indicates that a lawn watering ban will not be implemented.

- Bellevue Botanical Garden water features may operate daily, only from 8 am to 4 pm, should the water supply forecast indicate that a lawn watering ban will not be implemented.
- New ornamental and CIP landscape installations will be delayed until fall.

Mandatory Stage:

- At such time that mandatory lawn watering restrictions are implemented, all above measures shall be continued. Additionally, lawn irrigation at exempted parks will be further reduced on an incremental basis dependant upon the severity of the water shortage and demand reduction needed, as determined by the Utilities and Parks & Community Services Departments. Further restrictions on water features will also be considered at such times that mandatory lawn watering restrictions are implemented.
- Consistent with actions taken during the water shortage in 1992, in the event that a full mandatory ban on lawn watering is implemented, all park lawn watering will be stopped, except for the following sites which will be deficit watered to provide some green public areas within the community: Downtown Park Center Circle; Robinswood Cabana area lawn; Newcastle Beach Park; Bellevue Botanical Garden plant collections; athletic field activity areas; newly seeded turf areas.

Emergency Curtailment Stage:

- In the event that the Emergency Curtailment State of the Utilities Water Shortage Response Plan is implemented, all watering of City parks and facilities by use of domestic water supplies will be stopped.

CONTACTS:

| | | |
|--------------------------------|---------------------------|--------------|
| Parks Department Response: | call Resource Management- | 425-452-6855 |
| Utilities Department Response: | call Water Conservation- | 425-452-4127 |