3.0 Site Description and Inventory

The following sections summarize the findings from data analysis. The data is based on site visits and information extracted from existing resources and previous reports, and is described in an overview of the current site conditions.

3.1 Analysis of Existing Natural Resources

The environmental assessment completed by the GSA included information on the existing natural resources on the former Lorton Reservation, now referred to as Laurel Hill. This information was supplemented by field reconnaissance in December 2002, and in January 2003 to verify general physical, environmental and topographic features.

3.1.1 Geology, Soils and Topography

The landform at Laurel Hill consists of generally flat upland ridges that slowly decline about three hundred vertical feet toward the south and east to the Occoquan and the Potomac Rivers. Numerous small to mid-sized streams bisect these upland ridges and widen into flat-bottomed alluvial valleys at the lower ends of the local watersheds. The site lies partially within the Atlantic Coastal Plain and partially within the Piedmont Upland Province. Most of the upland terraces at the northern end of the complex are remnants of older fluvial gravel deposits. The elevation at the north end of the site is at about 300 feet above mean sea level (MSL), while the south portion of the site near the Occoquan River is at 10 feet MSL. The slopes in the upland portion at Laurel Hill vary from zero to 15 percent, while slopes leading directly into the many stream valleys often exceed 25 percent. The topography near Route 123 and the Occoquan River is particularly rugged (see Figure 7).

Soils, Slopes and Erodibility

The combination of soils types and topography can impact the level of soil erosion, the ability of soils to support building foundations, and the amount of water held in the soil. These soil characteristics can restrict the types of suitable land development. Field symbols are used to identify soil types on Figure 8. The symbols identify the type of soil, slope class, and long-term surface erosion. For example, Soil Map Symbol *55B2* indicates Soil Number = 55, a Slope Class of B, and an Erosion Class of 2.

Figure 7: Slope Analysis

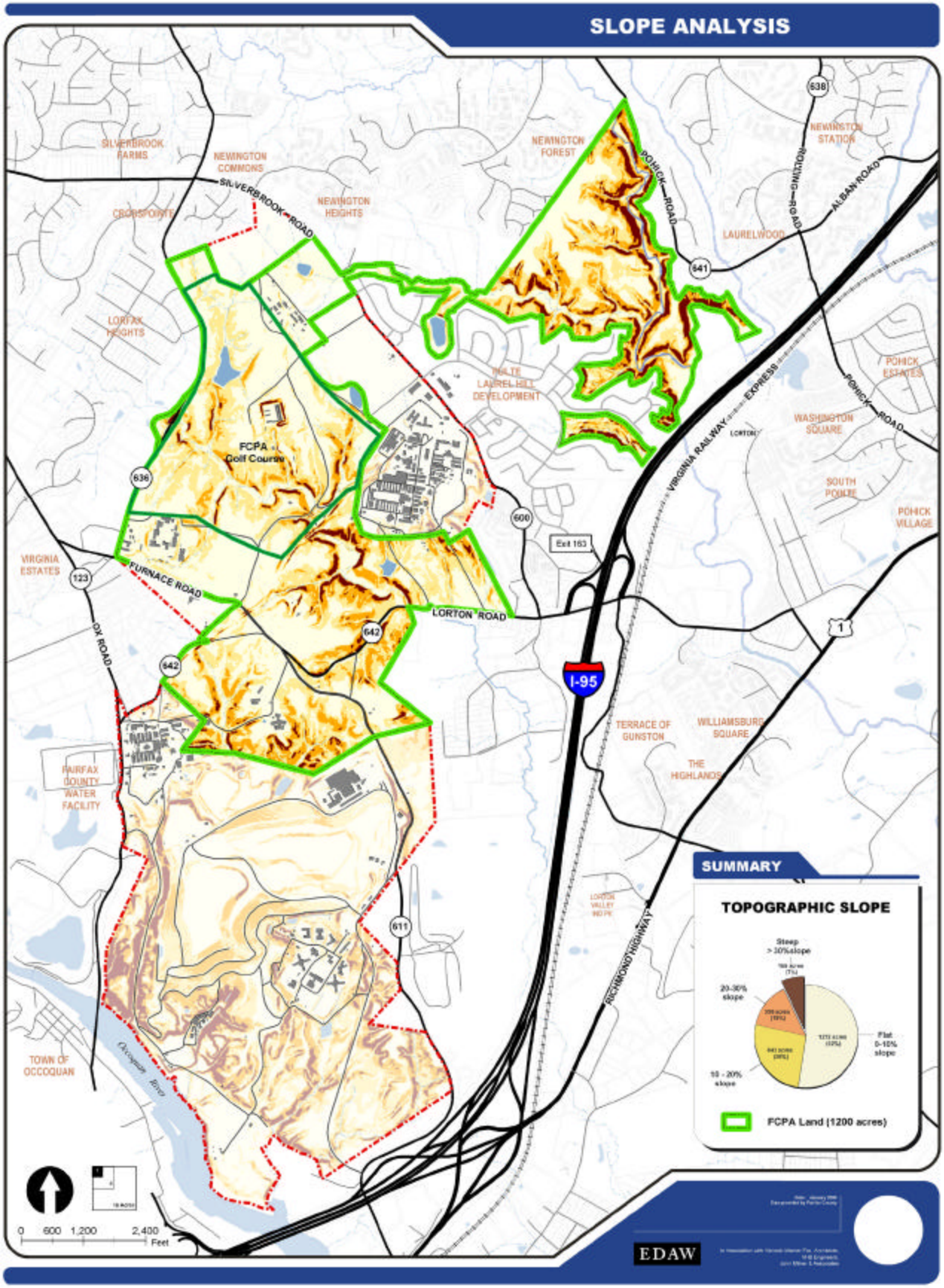


Table 1: Soils Ratings (as shown on Figure 8)

Slope Classes	Potential Erosion Symbols
A 0-2 percent	+ - Soil Accumulation (Low)
B 2-7 percent	0 - No Erosion (Low)
C 7-14 percent	1 - Slight Erosion (Low)
D 14-25 percent	2 - Moderate Erosion (Mod)
E 25+ percent	3 - Severe Erosion (High)

A combination of high slope and severe potential erosion indicates a poor location for development. Soil associations with low slope and low erosion are preferred locations for development. In addition, certain soils are considered problem soils for development. Class A soils (not to be confused with slope class) are problem soils due to unstable slopes and land slippage, high shrink-swell clays, or high water table conditions. These are often referred to as “marine clay” type soils. For development purposes an adequate engineering evaluation must be completed prior to design, and must be completed according to the geotechnical guidelines in the Fairfax County Public Facilities Manual and the Building Codes (BOCA, CABO, VUSBC). In addition, Class 'B' soils are problem soils that primarily have wetness and drainage problems that can be addressed with appropriate geotechnical recommendations, such as foundation drains for basements and crawl spaces.

In summary, soils constraints at Laurel Hill can be characterized as follows:

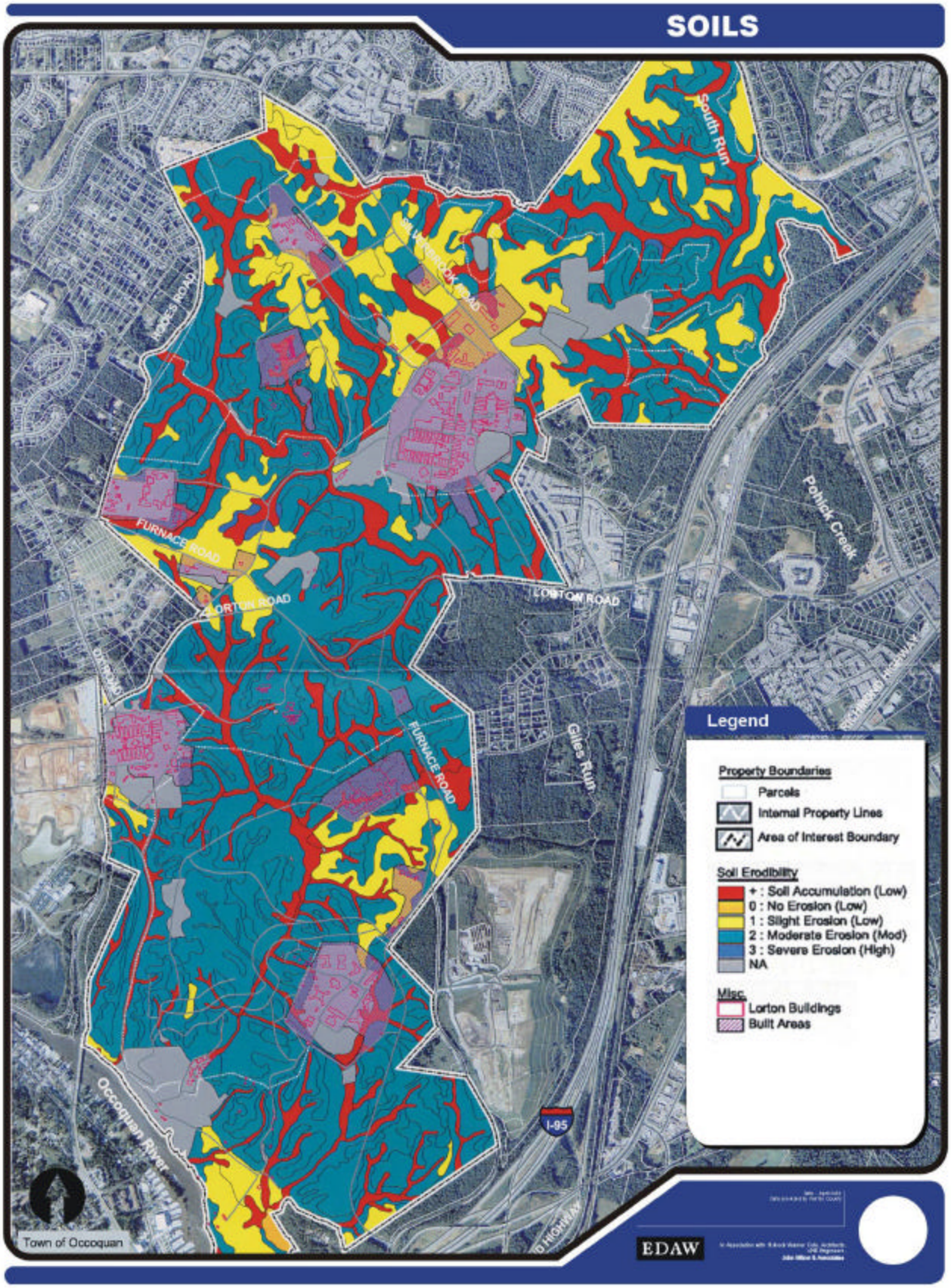
- Development should occur on soil classes with lower slope classes and lower potential for erosion;
- Soils with high slope classes and the potential for severe erosion are less suitable for development and should be retained in a natural state where possible. Additional landscaping may be required to reduce erosion;
- Problem soils A and B are not preferred for development, unless detailed geotechnical engineering analyses are completed that show suitable remedies for their inherent problems.

3.1.2 Water Resources

Groundwater

Laurel Hill Park is located within an outcrop of the lower Potomac Formation. The confined aquifer recharges from the east and the groundwater generally flows according to the topography and discharges into local streams toward the south. Fairfax County relies heavily on the Occoquan reservoir for drinking water. Watersheds in Laurel Hill do not flow into this reservoir (Laurel Hill Park drains into the free flowing Occoquan River and Belmont Bay). In 1997 Fairfax County conducted a Groundwater Risk Assessment that analyzed impacts by the landfill on groundwater and surface water resources. It found that the estimated risk to human health and the environment was well within accepted limits. Future developments within the site should take necessary steps to protect the quality of the local groundwater.

Figure 8: Soils



Surface Waters and Floodplains

All surface waters at Laurel Hill Park flow to the south and east into tributaries of the Occoquan and Potomac Rivers, and subsequently to the Chesapeake Bay. Figure 9 shows the location of local streams and the distribution of 100-year floodplains. The stream channels within the Lorton Property typically have steep banks and are gravel lined. In the upland ridges to the north, stream valleys are narrow and their channels have eroded banks. To the south and southeast broader floodplains bracket the streams. Laurel Hill lies within the Potomac-Shenandoah River Basin (Virginia State River Basin I). All the streams within Laurel Hill are classified as DEQ Class III streams, which are "Non-tidal Waters in the Coastal Plain and Piedmont Province" (the classification determines permit requirements by the Commonwealth of Virginia). No federal scenic rivers exist within Laurel Hill. There are several 100-year floodplains within the site. The site contains portions of three separate drainage basins that supply Pohick Creek (north), Giles Run (center), and Mills Creek (south). There are over 170 acres of on-site, 100-year floodplains within this basin..

Stream Protection Strategy

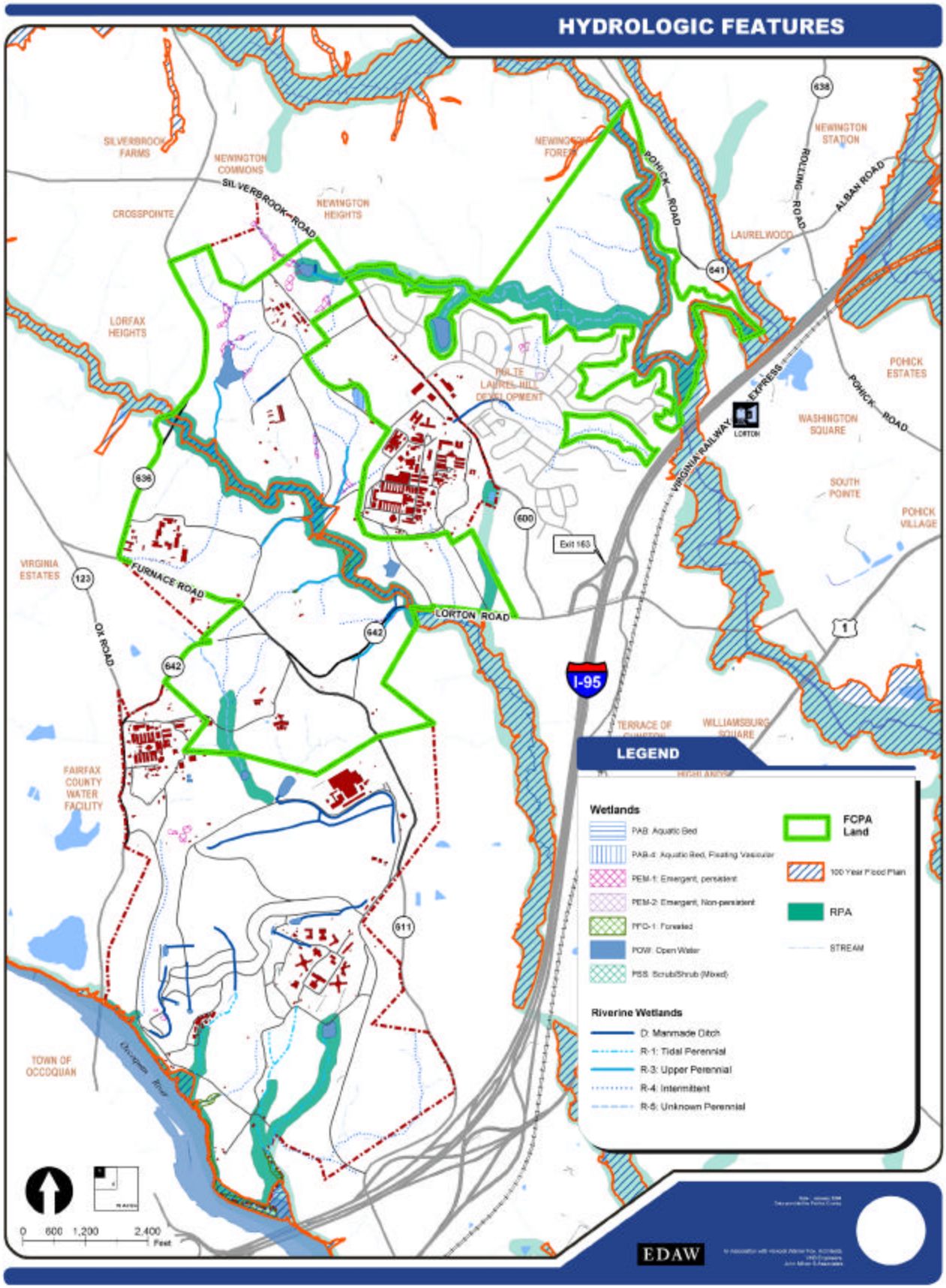
Fairfax County has completed a Stream Protection Strategy (SPS) Plan that focuses on preventing stream degradation and stream-bank erosion. The SPS program started in 1997 when the County implemented a comprehensive assessment of County streams. The results of the SPS baseline study (January 2001) are being used assign priorities for watershed management. A major goal of the SPS program has been and will continue to be increasing community involvement and awareness in water resources issues. Future development within Laurel Hill must comply with best management practices and regulations for stream protection. Existing wooded areas adjacent to streams should be preserved as buffers, and in cases where stream erosion is severe, should be expanded. Future objectives for the SPS program include implementing a long-term monitoring program that will assess water quality trends and the effectiveness of management strategies (see Fairfax County Stream Protection Strategy Baseline Study 2001).

Stormwater Management

Significant stormwater management regulations and design criteria regarding storm drainage, water quantity, and water quality have evolved at the local and state levels over the last decade. Redevelopment at Laurel Hill will require storm drainage and stormwater management facilities that are regulated by the Chesapeake Bay Preservation Act

Figure 9, Hydrologic Features, displays the stream network and RPA boundaries across the site.

Figure 9: Hydrologic Features



The Chesapeake Bay Act and the Chesapeake Bay Preservation Area Designation and Management Regulations, March 2002

Laurel Hill Park lies within one of the six watersheds protected under the Chesapeake Bay Preservation Act (CBPA). The CBPA regulations state that for redevelopment of existing areas, post-development pollutant runoff load may be 90% or less of pre-development (existing) pollutant loads (referred to as the 10% reduction standard). This criterion may be accomplished by the overall reduction in total impervious cover of the site by 10% or more, as well as the installation of on-site best management practices.

The Fairfax County Board of Supervisors adopted the amendments to the Chesapeake Bay Preservation Ordinance in July 2003. The amendments became effective an November 18, 2003 upon completion of the revised Resource Protection Area maps, which resulted from the perennial stream mapping project.

The Bay Act Regulations establish the Resource Protection Area (RPA) as the "shoreward" component of the Chesapeake Bay Preservation Area. RPA's are composed of tidal wetlands, non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow, tidal shores, such other lands considered necessary to protect the quality of state waters and a 100 ft. buffer adjacent to and landward of these features.

Virginia Stormwater Management Regulations, Amended 1998 and Virginia Erosion and Sediment Control Regulations, Amended 1995

These regulations were promulgated to protect the State's natural resources and downstream properties. These regulations require that post development storm runoff cannot exceed pre-development (existing) levels for the 2-year and 10-year frequency storm events. The regulations require protection for downstream properties from damage caused by localized flooding due to increases in volume, velocity and peak flow rate of stormwater runoff. This can be accomplished by the inclusion of detention and retention facilities integrated into the overall storm drainage systems. Siting of these facilities would generally be in the lower (downstream) areas, which would accept the storm drainage outfalls and attenuate the discharges into receiving adequate channel/storm drainage systems. These stormwater facilities may also be modified and used as temporary sediment basins/traps during construction to provide compliance with erosion and sediment control requirements. The Virginia Erosion and Sediment Regulations also require that concentrated stormwater runoff leaving a development site shall be discharged directly into an adequate natural or man-made receiving channel, pipe or storm sewer system. For those sites where runoff is discharged into a pipe or pipe system, downstream stability analyses at the outfall of the pipe or pipe system shall be performed.

General Virginia Pollutant Discharge Elimination System Permit Regulations For Discharge Of Storm Water From Construction Activities, June 1994

New development at Laurel Hill will require a Virginia Pollutant Discharge Elimination System Permit (VPDES) from the Virginia Department of Environmental Quality. This state issued permit

is required for any construction activity resulting in the disturbance of one acre or more of land area. This permit requires preparation of a Storm Water Pollution Prevention Plan to address appropriate controls and measures that will be implemented to control pollutants in storm water discharges during the construction of the project. An overall plan can be developed which can be amended to include phased construction as that phase is initiated.

The design of future stormwater infrastructure must comply with the Virginia Department of Transportation Drainage Manual, Revised April 2002 and the Fairfax County Public Facilities Manual, 2001. Fairfax County is interested in using Laurel Hill as a site to demonstrate the advantages of low impact development and new technology to reduce stormwater peak flows off developed sites. Potential candidates for this demonstration would be the redevelopment of the Central Maximum Security facility and Occoquan Workhouse Arts Center, the Laurel Hill Golf Course and other FCPA recreation facilities.

In summary, the existing storm drain systems on the developed portions of the property are likely past their useful life. Any future development or redevelopment on the site will require new stormwater management infrastructure and/or low impact development and new technology. The design and construction of storm drainage, storm water management, and erosion control systems should be in conformance with Fairfax County and state regulations and criteria. As a planning guideline 10-15% of land bays should be set aside for this new infrastructure.

3.1.3 Vegetation and Wildlife

The following section summarizes findings from the Forest Stand Delineation (FSD) that was prepared by Fairfax County in order to identify the types and conditions of existing forest at Laurel Hill. The purpose of the FSD is to provide a tool to be used during the site planning and review processes to determine the most suitable and practical areas for forest conservation and/or land development and its associated infrastructure.

Using a combination of resource mapping and field methods of ecology, an FSD inventories and describes existing forest and locates priority areas for retention, reforestation, restoration, and land development. The FSD becomes the methodology for evaluating the existing natural features and vegetation on a site proposed for development, taking into account the environmental elements that shape or influence the structure or makeup of a plant community. The FSD helps to locate stands of higher quality vegetation and retention value (i.e., old growth forests, unique forest stands, contiguous forest, etc.).

The sampling exercise at Laurel Hill provided information on:

- natural community types
- approximate age and size classes of a stand of dominant canopy trees
- number of live and dead standing trees per acre
- approximate cover by downed woody debris, invasive species, canopy, and herbaceous plants
- basal area of the stand
- species of herbs, shrubs, seedlings, and trees per acre

Natural Resources Inventory

A Natural Resources Inventory (NRI) for Laurel Hill was completed as the first step of the forest stand delineation. Using topographical maps, aerial photographs, and a soil survey, the following items were identified:

- soils
- forest cover
- tree cover
- steep slopes
- streams and wetlands

Methodology

The forest stands were delineated using standards as documented in the *State Forest Conservation Technical Manual*, Third Edition, 1997, Maryland Department of Natural Resources. Minor modifications were made to field protocols subsequent to discussions with the Natural Resources Protection Group of the Fairfax County Park Authority.

The study protocol involved the delineation of all forest stands and their acreage within the property boundaries. The forest stands are based on species composition, density, size, condition, and age of the stand. The dominant, co-dominant, and sub-canopy tree species for each stand are identified and tabulated to indicate their relative frequencies and average tree diameter class along with descriptions of each tree stand including the identification of the shrub and herbaceous species. The International Society of Arboriculture's *Valuation of Landscape Trees, Shrubs, and Other Plants*, Seventh Edition, 1988 was employed to help determine the age of each forest stand. In areas that were not forested, the vegetation and potential age of each natural community were characterized with fixed 0.1 acre plots and general observations.

Aerial photography of the tract was also analyzed to determine ground forest conditions and to make a preliminary determination of vegetation types occurring on the site. These vegetation types were then "ground-truthed" to verify composition, extent, and ecological importance.

Sample point locations were selected to represent the topographical and vegetative diversity at the site. At each sample point location, 37.2' radius circle (0.1 acre plot) was delineated, and the center of the circle was flagged and labeled. The sample points are located on the FSD map. Trees that fell within the 0.1 acre area were identified and collected. These data were used to estimate the number of trees per acre, per each two-inch diameter class. Information in the sample point data collection included:

- Percent canopy closure and tree species observed including relative dominance
- Percent and species of shrubs
- Percent and species of forest floor covered by herbaceous plants
- Percent of forest floor covered by downed woody debris
- The presence or absence of exotic or invasive species

The study also included a search on Virginia Natural Heritage Program's website for rare, threatened, and endangered vascular plants which are known to occur in the Pohick Creek watershed, Occoquan River – Reservoir watershed, and Lower Occoquan River. A formal rare plant survey was not conducted during the forest stand fieldwork.

Results

Rare, Threatened, or Endangered Vascular Plant Species

The small whorled pogonia (*Isotria medeoloides*) may occur at Laurel Hill, though was not informally observed on-site. This plant is listed as threatened on the federal list and endangered on the state list. It has a G2 global rank, a N2 national rank, and a S2 state rank. G2 means the species is very rare throughout the world. S2 means the species is very rare within the state, with only 47 known occurrences statewide. It is susceptible to becoming extirpated. There are no known occurrences in Fairfax County, though it does exist in the Occoquan Watershed. According to NatureServe, the "primary threat [to small whorled pogonia] is habitat destruction for residential or commercial development or forestry. Other threats such as herbivory, recreational use of habitat, and inadvertent damage from researcher activities have also been identified. At the present time 'natural' factors such as slug damage, mammal grazing, or forest succession do not appear to be significant threats to the larger populations."

Natural Communities

There are six natural communities on-site: bottomland forest, mixed oak forest, mesic mixed hardwood forest, pine-dominated forest, disturbed forest/scrub-shrub, field and hedgerows. These particular natural communities appear where they do, primarily because of past land use, topography, and hydrology. However, soils appear to have little influence on the locations of natural communities, except that rock outcrops and shallow soils are seen most often in the mixed oak forest and hydric soils usually appear within the bottomland forest community.

Community 1: Bottomland Forest

Floodplain and bottomland forest occupy approximately 95 acres of the study tract. Soils with poor to marginal drainage underlie this community. The bottomland forest is either dominated by tulip poplar (*Liriodendron tulipifera*) or silver maple (*Acer saccharinum*). Associate species are white oak (*Quercus alba*) and red maple (*Acer rubrum*). The forest age is variable, with some stands mature and greater than 80 years, and other disturbed stands less than 20 years old. The canopy trees in this forest were, on average, 16-inches diameter at breast height, though some stands have trees with greater than 24-inches diameter. Common trees include green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), American beech (*Fagus grandifolia*), oaks (*Quercus* spp.), blackgum (*Nyssa sylvatica*), mulberry (*Morus* sp.), hop hornbeam (*Ostrya virginiana*) and hickories (*Carya* spp.). Canopy closure ranges from about 40-65% and there are approximately 261 trees per acre with an average basal area of 88 ft^2. Common shrubs in this stand include spicebush (*Lindera benzoin*), pawpaw (*Asimina triloba*), brambles (*Rubus* sp.), highbush blueberry (*Vaccinium corymbosum*), greenbriar (*Smilax rotundifolia*), and common elderberry (*Sambucus canadensis*). These forests tend to have typical floodplain/bottomland understory plants including Jack-in-the-pulpit (*Arisaema triphyllum*), sensitive fern (*Onoclea sensibilis*), deertongue (*Panicum clandestinum*), bladder sedge (*Carex intumesens*), false nettle (*Boehmeria cylindrica*), poison ivy

(*Toxicodendron radicans*), Indian cucumber (*Mediola virginiana*), Japanese honeysuckle (*Lonicera japonica*), royal fern (*Osmunda regalis*), wild yam (*Dioscorea villosa*), grape fern (*Botrychium dissectum*), wild strawberry (*Fragaria virginiana*), Virginia white grass (*Leersia virginica*), Arthraxon (*Arthraxon hispidus*), and blue violet (*Viola* sp.). Herbaceous cover is much higher in this forest than the other communities on-site, ranging from 10-90%. Several of these stands are disturbed and have invasive vegetation, especially Japanese honeysuckle, cleavers (*Gallium* sp.), Asiatic bittersweet (*Celastrus orbiculatus*), tall fescue (*Festuca arundinacea*), and multiflora rose (*Rosa multiflora*). Woody debris covers approximately two to seven percent of the ground. Dwarf ginseng (*Panax trifolium*), an uncommon plant in Virginia, was found in several stands of bottomland forest.

Community 2: Mixed Oak Forest

Mixed Oak Forest occupies approximately 355 acres. It generally occurs on steep slopes with shallow soils and rock outcrops. This forest stand includes the Acidic Oak-Hickory, Mixed Oak/Heath, and Chestnut Oak/Heath natural communities as designated by the Virginia Natural Heritage Program. Heaths refer to the Heath family (Ericaceae), which includes blueberries, azaleas, and mountain laurel, among other species. The Chestnut Oak/Heath communities are on the steepest slopes in the southern section of the site and have very little to no herbaceous plants. Dominant canopy species in the mixed oak forest community are white oak and chestnut oak (*Quercus prinus*). Dominant trees generally range from 18-22" dbh. This stand is the oldest natural community on-site and is approximately 90-110 years old. Because this stand tends to grow on steep slopes, it often was not targeted for logging. Other common canopy species include hickory, American beech, and tulip poplar. The canopy was approximately 60-65% closed and there are approximately 274 trees per acre with an average basal area of 111 ft^2. In particular, the stand in the northern forest block was dominated by mountain laurel. Other common shrubs include lowbush blueberry (*Vaccinium angustifolium*), witch hazel (*Hamamelis virginiana*), American holly (*Ilex opaca*), flowering dogwood (*Cornus florida*), maple-leaf viburnum (*Viburnum acerifolium*), and arrowwood viburnum (*Viburnum dentatum*). Generally, the herbaceous layer was very sparse with the most common plants being spotted wintergreen (*Chimaphila maculata*), greenbriar, wild yam, wood aster (*Aster divaricutus*), Solomon's seal (*Polygonatum biflorum*), and tick trefoil (*Desmodium* sp.). Exotic species were not common and invasive occupied about 0-1% of the shrub and herb layers. Coarse woody debris covered approximately 5% of the ground in this forest stand.

Community 3: Mesic Mixed Hardwood Forest

The mesic mixed hardwood stand occupies approximately 219 acres. This stand occupies shallower slopes than the mixed oak forest and along streams where the soil is well drained. It is dominated by tulip poplar, beech, and oaks. The average canopy tree is approximately 17" dbh and is approximately 60-70 years old. Subcanopy trees include red maple, hickories, American holly, Virginia pine (*Pinus virginiana*), black cherry (*Prunus serotina*), flowering dogwood, black gum, ironwood (*Carpinus carolinana*), and fringe tree (*Chionanthus virginicus*). On average, there are approximately 330 trees per acre with a basal area of 99.2 ft^2. Common shrubs and vines include mountain laurel (*Kalmia latifolia*), greenbriar, American holly, viburnums, shadbush (*Amelanchier canadensis*), pink azalea (*Rhododendron periclymenoides*), highbush and lowbush blueberries, and brambles. The herbaceous community is more diverse and abundant that in the mixed oak forest, but less than the bottomland forest. Herbs covered approximately 2-50% of the ground. Common herbs

include Solomon's seal, wood reedgrass, spotted wintergreen, dissected grape fern, New York fern, wild yam, deertongue grass, wild strawberry, tick-trefoil, bloodroot, wood sorrel (*Oxalis* sp.), Jack-in-the-pulpit, and Christmas fern (*Polystichum acrosticoides*).

Community 4: Pine-Dominated Forest

Pine-dominated forests occupy approximately 142 acres. Virginia pine and loblolly pine (*Pinus taeda*) dominate the canopy of this stand. However, no pine seedlings were found in the plots, which indicates that the community will not stay pine-dominated. Instead, it is in transition to mesic mixed hardwood or mixed oak forests, depending on the gradient, aspect, and soils. It has approximately 368 trees per acre with an average basal area of 119 ft^2. Most of this stand appears to be approximately 50-60 years old. However, within this community is a monoculture white pine (*Pinus strobus*) plot (Plot E24) and a plot dominated by white and yellow pines (*Pinus echinata*) (Plot E31). Common hardwood species found in the canopy include black locust (*Robinia pseudo-acacia*), tulip poplar, white oak, chestnut oak, red maple, and eastern red cedar (*Juniperus virginiana*). Seedlings include red maple, sassafras, white oak, black cherry, American beech, sweetgum (*Liquidambar syraciflua*), southern red oak (*Quercus falcata*), pignut hickory (*Carya glabra*), black locust, chestnut oak, willow oak (*Quercus phellos*), eastern red cedar, northern red oak, and tree of heaven (*Ailanthus altissima*). Invasive species are common and occupy approximately 20% of the herbaceous and shrub layers, though some plots had no invasives and one had 100% invasive coverage. Invasives included tree of heaven, Japanese honeysuckle, Asiatic bittersweet, multiflora rose, autumn olive (*Elaeagnus umbellate*), henbit (*Lamium amplexicaule*), and Japanese knotweed (*Polygonum cuspidatum*). Besides the ones listed above, common vines and shrubs included greenbriar, poison ivy, American holly, brambles, Virginia creeper, persimmon, wineberry (*Rubus phoenicolasius*), maple-leaf and arrowwood viburnum, and lowbush blueberry. Downed woody debris occupied approximately 5% of the ground.

Community 5: Disturbed Forest and Scrub-Shrub

Disturbed forest and scrub-shrub communities generally are adjacent to fields, barns, or development. They occupy approximately 59 acres at Laurel Hill. Disturbed forests have a large edge effect shown by the domination of invasive vines, such as Japanese honeysuckle, poison ivy, and Virginia creeper. Common canopy species include black cherry, tree-of-heaven, red maple, and white oak. This forest on average has 282 trees per acre with an average basal area of 46 ft^2. The average canopy tree is 8-inches dbh and 28 years old. These plots generally had a lot of herbaceous cover and little downed woody debris. The scrub-shrub community is dominated by shrubs and young trees and has been fallow for approximately a decade. These areas are dominated by multiflora rose, Japanese honeysuckle, brambles, eastern red cedar, and tree of heaven.

Community 6: Meadow and Hedgerows

This stand was released from agriculture within the last several years and has almost no canopy cover. There are approximately 793 acres of meadow and 70 acres of athletic fields. The athletic fields are maintained in fescue. No data sheet was generated for Plot I09 because it was an athletic field. Generally, the meadows are dominated by common field species such as tall fescue, shasta daisy (*Leucanthemum vulgare*), redtop grass (*Agrostis gigantea*), timothy (*Phleum pratense*),

bluegrass (*Poa pratensis*), deertongue, thistle (*Cirsium* sp.), yellow mustard (*Alliaria petiolata*), annual ragweed (*Ambrosia artemisiifolia*), and goldenrods (*Solidago* sp.). Hedgerows on site separate fields or line streams. The hedgerows are dominated by red maple, black willow, black cherry, staghorn sumac (*Rhus hirta*), sassafras, grape (*Vitis* sp.), multiflora rose, brambles, poison ivy, and greenbriar.

Management Recommendations

Laurel Hill Park is planned to include some preserved areas, as well as developed athletic fields, trails, and other recreational and cultural activities. There are several ecological and conservation factors that should be weighed when deciding which areas to preserve and where to possibly develop.

Large blocks of undeveloped forest, like the one north of Silverbrook Road in the Laurel Hill area, are rare throughout Northern Virginia and along the east coast due to population growth and expansion of suburbs. Large blocks of forest function as intact ecosystems and provide habitat for wildlife that are not adapted to urban environments. Often this wildlife, such as ovenbirds, wood thrush, and red-eyed vireo, need interior forests. The definition of interior forest depends on the individual species needs, but a working definition is greater than 60 acres of forest more than 300' from a forest edge. Interior forests typically have less light, less invasive species, and "tighter" nutrient cycling than edge forests. The unfragmented blocks of forest in the northern section of Laurel Hill are connected to the South Run Stream Valley Park. This connectivity allows for animals and certain plant species to disperse; thereby maintaining the resiliency of the ecosystem to disturbances and contributing to regional biological community stability.

The forest in the southern section of Laurel Hill adjacent to Occoquan Regional Park has hemlock (*Tsuga canadensis*) in the stream valleys and is dominated by chestnut oak on the dry slopes and plateaus. We recommend conserving much of this forest for headwater protection and its uncommon forest community of hemlock. Additionally, much of this area has steep slopes, which may pose a challenge to development.

Cutworm is devastating the forests at Laurel Hill, particularly in the southern section. The worm chewed through 30% or more of the green leaves on oaks and other hardwoods during our time of observation. We did see spraying for cutworm while we were evaluating the forests. Population densities should be monitored and control methods of this invasive species should continue in any retained forest to ensure the health of the forest.

The patches of forest in the center of the site, between Silverbrook Road and the landfill, have a high edge to core ratio and are over-run with invasive species. In this area, we recommend retaining forested stream buffers and expanding the buffer along parts of Giles Run (see data station E26), and retaining large specimen trees. The remainder of the disturbed forest is not nearly as valuable as other forests on-site because they are young and dominated by invasive species.

Meadows on the property are generally dominated by common native, as well as exotic species. *Krigia dandelion*, an uncommon plant, and aggregations of other native species were seen near a pond in the area of the old rifle range. These meadows and old fields provide habitat for grassland

birds. This habitat is declining in the area due to intensified development. Of particular importance on-site are large blocks of fallow fields near open water, such as the farm ponds on site. Silos and barns provide nesting sites for raptors, such as the barn owl seen nesting in one of the silos. If fallow fields are retained, proper management of these fields to increase ecological and structural complexity, will result in higher biodiversity. For instance, different fields could be managed in a one, three, or five-year rotational practices to control woody plant, maintain their openness, and provide varying levels of structural diversity.

3.1.4 Threatened, Endangered and Sensitive Species

The *Laurel Hill Natural Resources Survey* from March 1999 conducted by volunteers from regional naturalist organizations lists species observed on-site. Notable species seen include large-whorled pogonia, which shares similar habitat as the endangered small-whorled pogonia, fragrant goldenrod, white-crowned sparrow, fox sparrow, Henslow's sparrow, grasshopper sparrow, bobolink (all grassland birds), least and semipalmated sandpipers, and American pipet. The group has since observed northern saw-whet owl, an animal of special State concern.

Table 2: Summary of Species Observed in Laurel Hill Natural Resources Survey, 1999

Location	***Selected Species Observed***
Occoquan Regional Park	Wading birds; waterfowl; bald eagles; ospreys; gulls and terns; warblers and other neotropical species
Former Dairy Farm	Roosting vultures (turkey and black); blackbirds; several bird edge species; toothwort; hepatica; and trailing arbutus
Former field with pond between Silverbrook Road and NIKE Site	Several bird edge species and grassland species (e.g. meadowlarks, finches and sparrows); white-crowned sparrow; fox sparrow; Henslow's sparrow and bobolinks Numerous open-air butterflies (e.g., swallowtails, sulphurs, blues and skippers)
Former field with pond northwest of Central Maximum Facility	Wood ducks; green herons; several edge bird species and migrating warblers; barn owls; bob-white quail; and bobolinks
Former field / wooded area west of Central Facility between Furnace and Silverbrook Roads	Various warblers; black vultures; and grasshopper sparrow
Old field and upland forest northeast of Silverbrook Road	Numerous uncommon bird species including wintering American pipits; northern harriers; accipiters (sharp-shinned and Copper's hawks); creepers; kinglets; and numerous woodpecker species Oak barren niche with fragrant goldenrod; spring ephemerals; ferns; and orchids including large whorled pogonia

3.2 Analysis of Existing Built Resources

3.2.1 Utilities and Infrastructure

The utilities and infrastructure at Laurel Hill Park were set in place in support of Lorton prison, where the majority of structures were focused into two primary areas: the Occoquan Workhouse and Central / Maximum Facility. Currently, the relationship of utilities from these facilities to Laurel Hill Park remains limited to what was set in place for use by the prison.

The age of the former Lorton Prison Complex and its unique ownership and relation to the local utility providers implies that much of the existing utility infrastructure is beyond its useful life. The following section evaluates each of the utilities: water, sewer, solid waste, electricity and gas. Figure 10, Utilities and Infrastructure, displays their status on the Laurel Hill site. The sanitary sewer system is the most critical in terms of constraints to development and is shown on a separate Figure11, Sanitary Sewer System.

The utility lines and infrastructure that lie within Laurel Hill were constructed and maintained by the Federal government and the D.C. Department of Corrections, and not the local service providers. As such they lay outside the "*approved service areas*" for many of the utility providers in Fairfax County. For example, the water and sewer systems that serve Fairfax County have boundaries that define where they will provide new sewer connections or provide new water service. The sewer service area was expanded to include all portions of Laurel Hill east of Route 123 and south of Silverbrook Road to the Occoquan River. For water and sewer service to any future new development within Laurel Hill, it will be necessary to provide new connections to the appropriate newer infrastructure. These utility constraints to future development are discussed in the following sections.

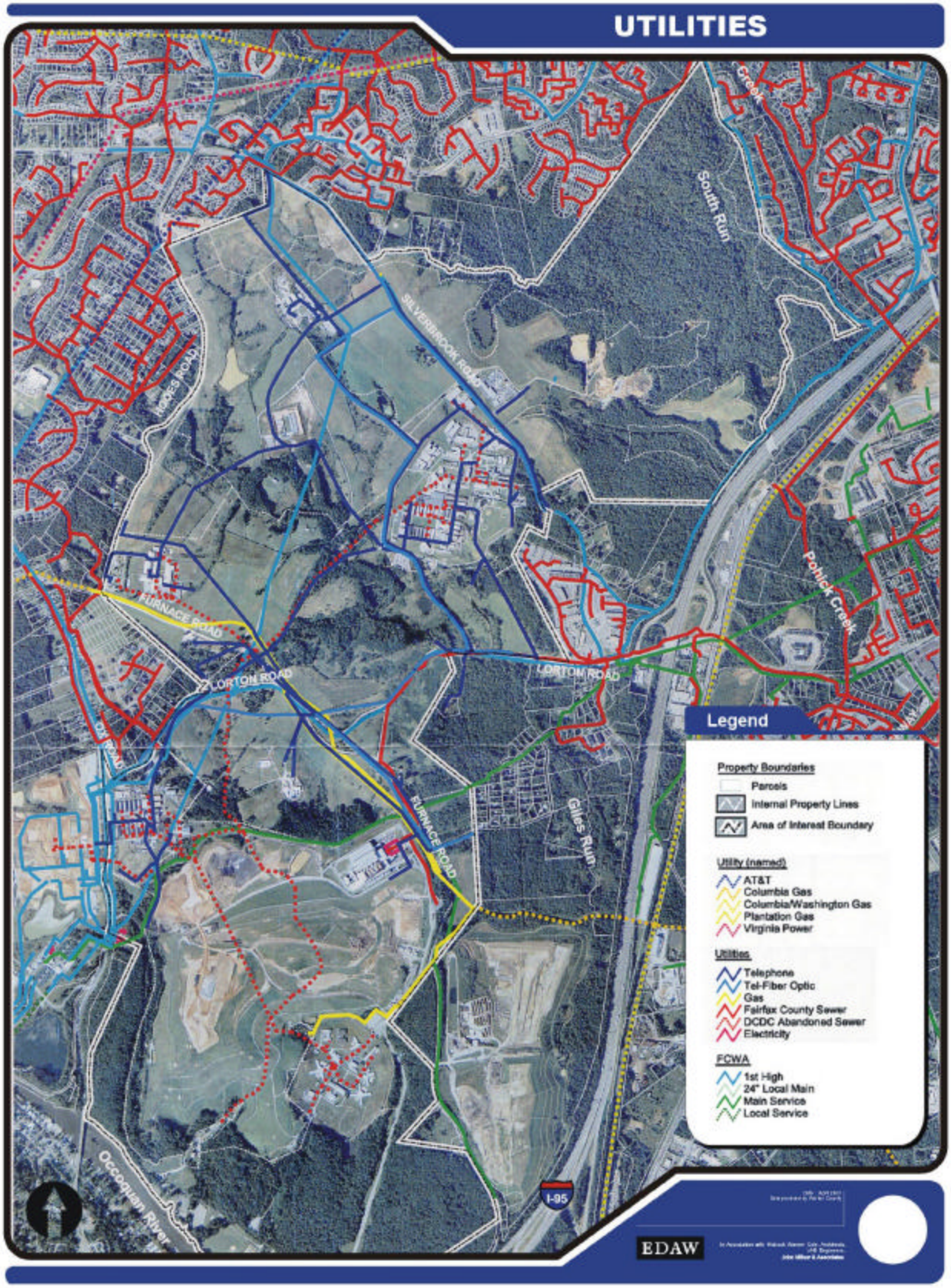
3.2.2 Water Systems

Existing Systems

The Fairfax County Water Authority (FCWA) owns no distribution facilities within the former prison property. Moreover, the FCWA will not take into their system any water infrastructure or facilities formerly owned by the federal government. There are no records of their condition, and evaluating their condition could be more costly than building new systems. The age of these systems implies they are beyond their expected service life. Without further analysis of the water infrastructure it is assumed that these systems are of little value to future development.

The FCWA operates two "First High Mains" at a 420-foot to 440-foot design grade line across the property (see Figure 10). A newly installed 42-inch transmission main traverses the property from the new water treatment plant at Route 123, to the northern edge of the Laurel Hill near the proposed middle school site on Silverbrook Road. A 30-inch First High Main follows Lorton Road from the new water treatment plant to the Lorton Road / I-95 intersection. Also operating on the First High grade line are several 24-inch and 12-inch service mains along Silverbrook Road, and 12-inch and 30-inch lines along Route 123. A 30-inch "Second High Main" with a design grade line of 330 feet to 335 feet traverses the property from the new treatment plant eastward cross-country to the Lorton Road / I-95 intersection. Intersecting this line is a 16-inch distribution line following Furnace Road.

Figure 10: Existing Utilities Network



Development Constraints

The older existing water distribution lines cannot be used for future water service. These older water lines should be abandoned in place or removed during redevelopment. Any new development will require tapping into the newly built first or second high main water distribution systems. The FCWA prefers tapping existing distribution mains, and not directly into the high mains. Main taps in this area could require pressure-reducing vaults. These new water lines should provide an abundant water supply with numerous access possibilities for the entire site.

3.2.3 Sanitary Sewer Systems

Existing Systems

The Fairfax County Department of Public Works and Environmental Services (DPWES) Wastewater Planning and Monitoring Division (WPMD) control very few sewer facilities on the Laurel Hill site. The majority of the site is not served by public sewer service. An old sanitary sewer treatment facility that served the site was closed when the prison closed. As is the case with the Fairfax County Water Authority, the WPMD will not accept into their system any sanitary lines formerly owned by the federal government or the D.C. Department of Corrections. The age of these sewer systems is likely beyond their expected service life. Thus, the existing network of sewer lines within the former prison facility is of little value to redevelopment.

3.2.4 Solid Waste

Fairfax County Division of Solid Waste Disposal & Resource Recovery (DPWES) manages the disposal of solid waste in the County. The I-95 Energy Resource Recovery Facility is about 378 acres in size including all facilities and buffer areas. The privately operated waste-to-energy plant is one of the largest in the nation. Four furnaces can incinerate up to 3,000 tons per day of solid waste while producing up to 83 Megawatts of electricity. Ash byproducts are disposed in the adjacent Ash Landfill. The location of the landfill's methane gas collection system and groundwater monitoring wells are indicated in Figure 10. The landfill gas collection piping system lies within the landfill's boundary. Groundwater monitoring wells are scattered around the landfill, with some off of the landfill property. The Division of Solid Waste Disposal & Resource Recovery indicated that no other landfills exist on Laurel Hill; however the Final Environmental Assessment indicated that an abandoned landfill was located on the prison site. It is unlikely this landfill had an infrastructure for collecting landfill gas or monitoring wells.

Redevelopment of the I-95 Landfill

The I-95 Landfill has been used solely for the disposal of incinerator ash byproducts from the Energy Resource Recovery Facility since 1990. The landfill is slated for closure by 2025, and is approaching capacity. The Energy Resource Recovery Facility will likely remain in operation, but ash byproducts would be disposed off-site. The DPWES has completed a Closure/Post Closure Plan for the landfill (revised February 2003). This plan was prepared for the Virginia Department of Environmental Quality (DEQ) and meets the State's requirements under their solid waste management regulations.

The landfill closure plan describes the sequence of closure and maps the final contours for the site. Once the landfill is closed the facility could be used for passive recreation, allowing for ongoing post-closure activities. The DPWES will require full access to the site to conduct post-closure monitoring and maintenance of the gas collection system, the groundwater monitoring wells and the landfill slopes and cover. As the landfill subsides the topography and slopes will have to be maintained to ensure adequate stormwater runoff, which prevents erosion of the landfill cover..

3.2.5 Electricity

Dominion Virginia Power indicated all of the electric facilities within the former Lorton Reservation property are privately owned, and their age exceeds the expected life span of such systems. As such, Dominion Virginia Power will not take them over. Therefore, new development on the property will require the installation of new electric distribution systems. Dominion Virginia Power will perform this construction upon coordination with the particular development site based on its needs. Existing system access points, adjacent system voltages, and other such system data were not provided. Dominion Virginia Power will evaluate each development proposal and design the access solution for each. Electrical infrastructure and supply will not be a constraint to future development.

3.2.6 Natural Gas

Washington Gas and Columbia Gas currently have distribution systems traversing the site, and formerly provided gas service to the prison. The Energy Resource Recovery plant also uses gas at peak periods. Gas transmission lines traverse the Laurel Hill property from west-to-east, generally following Furnace Road, crossing I-95 just north of the Construction Debris Landfill. Gas service is available to the entire Laurel Hill property, and Washington Gas will design the access solution for each development area. Gas infrastructure and supply will not be a constraint to future development.

3.2.7 Telecommunications

Numerous telecommunications facilities lace the former DCDC property. Verizon operates copper and fiber optic systems on the property. Overhead or buried copper accesses nearly all the existing building areas. Buried fiber optic runs adjacent to Furnace Road, Lorton Road, Silverbrook Road, and borders the western edge of the Central Facility, connecting to Silverbrook Road. Verizon will evaluate the adequacy of existing telephone systems for any particular development on an individual case basis; however, significant telephone capacity exists on the property. Telecommunications infrastructure and supply will not be a constraint to future development. Leases to support telecommunication infrastructure should be considered.

3.2.8 Transportation Systems

Laurel Hill, located in southeastern Fairfax County, is very accessible from the regional highway system with direct access from Interstate 95 (I-95) via Lorton Road -Route 642 (Exit 163) to the east and Route 123 (Exit 160) in Prince William County to the south. Interstate highway I-95 is located to the east of the site, Hooes Road (Route 636) to the west of the site, Route 123 (Ox Road) to the south of the site, and Silverbrook (Route 600) to the northeast of the site.

Local/Regional Transportation Routes

To the east of Laurel Hill, I-95 is an eight-lane, north-south freeway, operating with three general-purpose travel lanes in each direction, with a reversible two-lane high occupancy vehicle (HOV) roadway located in the median. The HOV lanes are currently accessible at the Route 123 interchange, but not at the Lorton interchange.

- Route 123 (Ox Road) is a major principal arterial, providing links between I-95, the Town of Occoquan, Burke, and Fairfax. Ox Road connects to the Fairfax County Parkway approximately seven miles to the west of the Lorton/Laurel Hill site.

- Lorton Road (Route 642) starts to the west of the site at its intersection with Ox Road, meanders through the Lorton/Laurel Hill site, passes underneath I-95 (at its interchange Exit 163), and then terminates at U.S. Route 1. Lorton Road is currently a two-lane arterial roadway, except in the vicinity of I-95 and Silverbrook Road where it widens to a four-lane roadway section.

- Hooes Road (Route 636) is primarily a two-lane, two-way arterial roadway that connects to the Fairfax County Parkway approximately a mile and half north of its intersection with Silverbrook Road. A small section of Hooes Road, between Ox Road and Furnace Road, is currently a one-way, one-lane northbound roadway.

- Furnace Road (Route 611) is a two-lane arterial roadway, providing a connection between Ox Road in the west, connecting and running coincident with Lorton Road for a short distance in the center of the Lorton/Laurel Hill site, before heading south between the old and new landfills, crossing under I-95 and connecting into U.S. Route 1.

- Silverbrook Road (Route 600) is primarily a two-lane arterial roadway providing a connection between Ox Road to the west and Lorton Road to the east.

Within the vicinity of the site, traffic signals are located on Ox Road at its intersection with Lorton Road, at the intersection of Silverbrook Road and Hooes Road, and on Lorton Road at its intersections with Silverbrook Road and Gunston Cove Road/northbound I-95 ramps.

Proposed Transportation Improvements

Significant roadway improvements are planned in the vicinity of Laurel Hill over the next two decades, as documented in the Fairfax County Comprehensive Plan, see Figure 11.
The following roadway improvements are proposed with the Comprehensive Plan:

- Route 123 (Ox Road) is currently being widened from its existing two-lane cross section to a four-lane, divided roadway facility to the west of Silverbrook Road, and construction is expected on the section between Silverbrook Road and the Occoquan River bridge in 2004. The roadway has been designed for ultimate expansion to a six-lane roadway.

- I-95 has been identified in the Comprehensive Plan as an ultimate 11-lane facility. This would add one travel lane in each direction plus a third HOV lane; however, this improvement is not currently within the Virginia Transportation Development Program (the Virginia Department of Transportation's six-year design and construction program).

Many other improvements of study area roads were identified during the Environmental Assessment of Laurel Hill. They include:

- Realignment and widening of Lorton Road: Lorton Road between its western intersection with Furnace Road and Richmond Highway (Route 1) is identified on the comprehensive plan as an ultimate six-lane roadway. The western end of Lorton Road, between Furnace Road and Ox Road, is proposed as a four-lane roadway cross section.

- Eastern section of Furnace Road: As shown on the Comprehensive Plan, a section of Furnace Road would be realigned and reconstructed as a four-lane roadway to connect into the new Lorton Road at a right angle "T" intersection. To the south, the existing roadway would be widened to a four-lane road along its entire length to its southern termination at U.S. Route 1. This would require bridge improvements at the Furnace Road underpass of I-95.

- Western section of Furnace Road: This road would be widened to four lanes between its intersection with Lorton Road and Ox Road.

    - Silverbrook Road between Lorton Road and Hooes Road: Widen to a four-lane roadway.

    - Hooes Road will be improved in three phases:

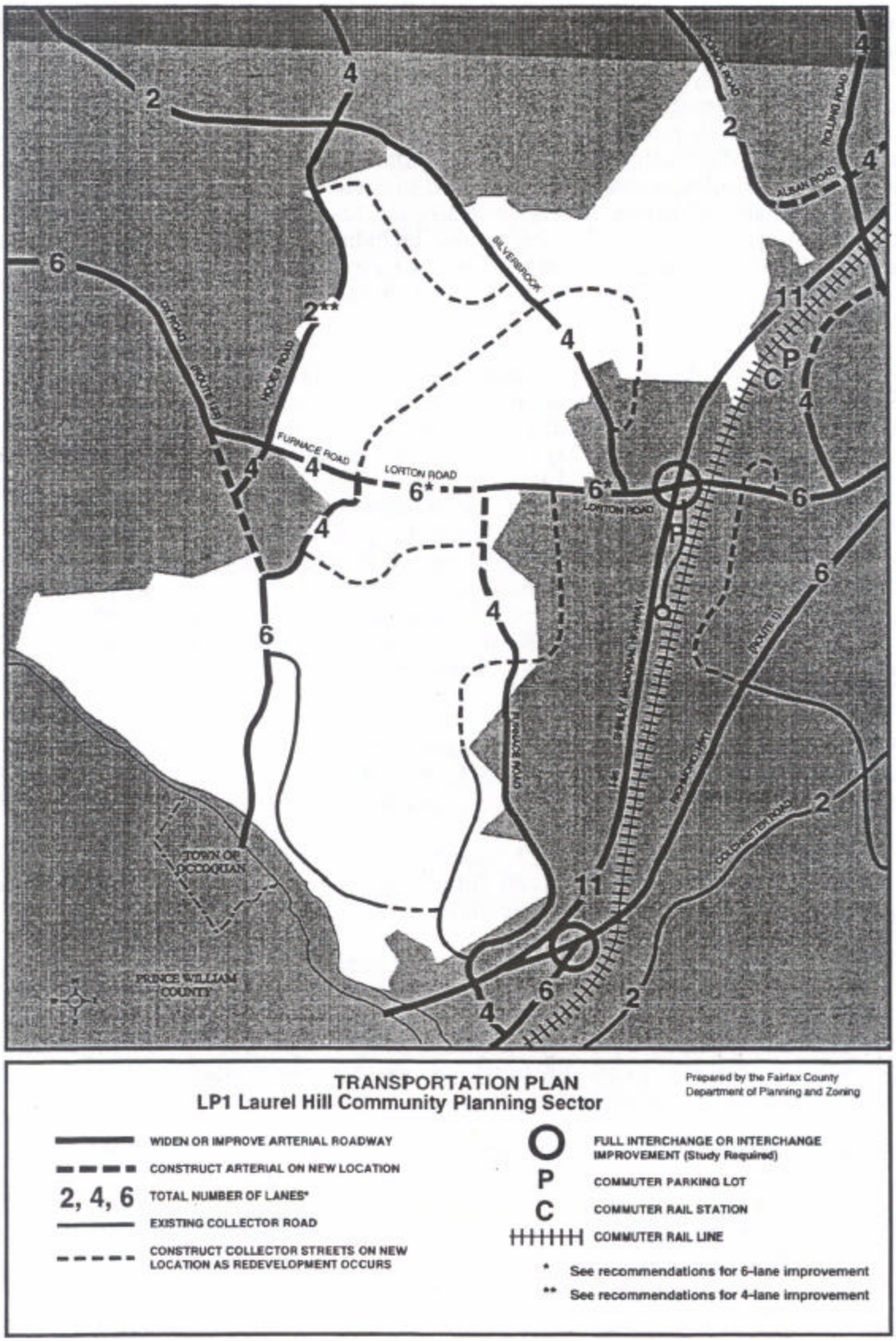
    1. Widen Hooes Road between Ox Road and Furnace Road to a four-lane roadway.

    2. Widen Hooes Road between Silverbrook Road and the Fairfax County Parkway to a four-lane roadway.

    3. Obtain additional right-of-way and reserved for a future four-lane improvement on Hooes Road between Furnace Road and Silverbrook Road.

    Prior to redevelopment Hooes Road should be improved to VDOT standards. Improvement to four lanes for this section of Hooes Road should only be considered after the completion of other planned major arterial improvements in the area, and if recommended in a transportation study for the purpose of providing capacity for through traffic.

Figure 11: Road Improvements per Fairfax County Comprehensive Plan



Bicycle/Pedestrian Access

Laurel Hill is not currently well served by bicycle or pedestrian facilities designed either for exclusive use or shared use. A graphic depicting the proposed county trail system as delineated in the Countywide Trail Plan is shown in Figure 12. The eastern portion of Lorton Road, the southern portion of Ox Road and the southern portion of Furnace Road are all currently designated as part of the signed bicycle route number 1. These roads, however, do not have paved shoulders. Furnace Road also experiences a high volume of heavy vehicles (trash trucks, tractor-trailers, etc.) destined to and from the landfill and the resource recovery facility.

Existing hard and soft surface trails currently located outside Laurel Hill do not form a comprehensive, connected system. The proposed primary and secondary trail network, as envisioned in the Fairfax County Comprehensive Plan, was designed to improve existing bicycle/pedestrian access deficiencies by making connections both within Laurel Hill as well as through it.

Public Transportation

Laurel Hill is well served by public transportation facilities on its north and east sides, however, there are no public transportation facilities located in the southern and western side of the site. Public transportation is currently provided by three different transit agencies:

Virginia Railway Express: Commuter rail service is provided from the Lorton rail station, located on Lorton Station Boulevard (east of I-95). This line operates between Fredericksburg, VA, and Union Station (Washington, D.C.) with stops (north of the site) at the Franconia-Springfield Metrorail station, King Street-Alexandria, Crystal City and L'Enfant Plaza. Service is provided during the weekday morning and evening rush hours, and is heavier in the peak direction (northbound in the morning, southbound in the evening). This rail line is also used for Amtrak service, however, stop service is not provided at this station. Northbound trains include 300, 302, 304, 306, 308 and 310. Southbound trains are 301, 303, 305, 309, 311, and 313.

Fairfax Connector operates four bus lines in the vicinity of the Laurel Hill:

- Route 303: Starting near the intersection of Lorton Road with Silverbrook Road, this bus line runs on Lorton Road, Richmond Highway and Telegraph Road, terminating at the Springfield/Franconia Metro Station

- Route 305: Running on Hooes Road north of the site, this line connects to the Franconia-Springfield Parkway and terminates at the Springfield/Franconia Metro Station.

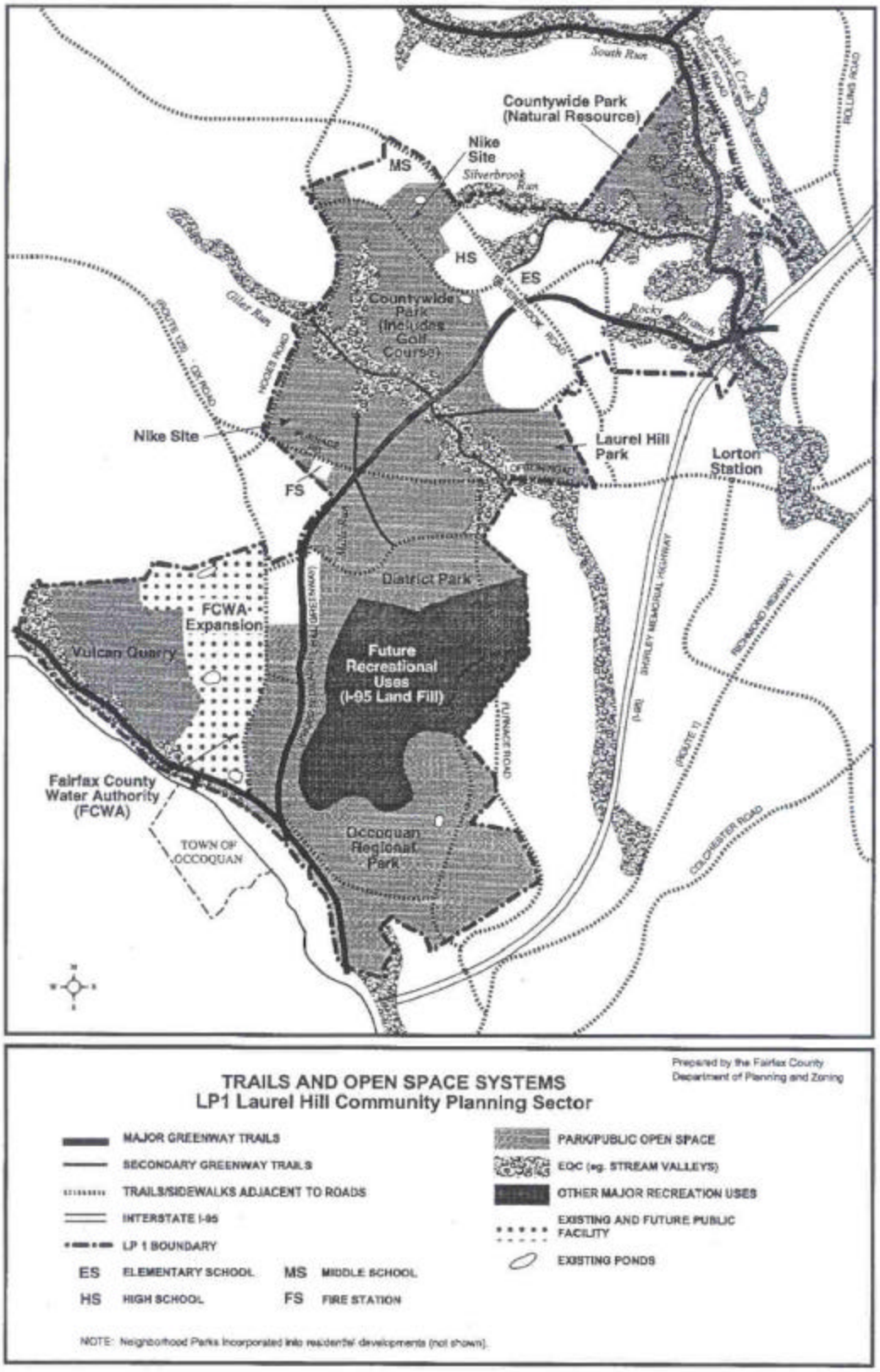
- Route 383: Starting near the intersection of Lorton Road with Silverbrook Road, this bus line runs express on I-95, terminating at the Pentagon Metrorail station

Route 385: Starting near the intersection of Lorton Road with Silverbrook Road, this bus line runs on Silverbrook Road through Laurel Hill, connecting to the Franconia-Springfield Parkway, and then terminating at the Pentagon Metrorail Station.

Metrobus (owned and operated by the Washington Metropolitan Area Transit Authority) operates the Richmond Highway bus line (Route 9A). This bus line starts at the Lorton VRE rail station on Lorton Station Boulevard (east of I-95) and terminates at the Pentagon Metrorail Station.

In addition, the Virginia Department of Transportation (VDOT) has a park and ride facility immediately adjacent to the intersection of Gunston Cove Road with Lorton Road. This parking lot was recently improved. From this parking lot, access to Fairfax Connector buses 303 and 383 is possible.

Figure 12: Trails Network per Fairfax County Comprehensive Plan



3.2.9 Existing Structures

The transfer of the Laurel Hill property required compliance with the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act. During the Environmental Assessment process, approximately 552 acres and 136 buildings were identified as contributing to a National Register Eligible historic district. Of these 136 structures 14 are within Laurel Hill Park. The NEPA and Section 106 compliance activities were initiated in March of 1999 and were completed in 2000. Figure 13 highlights the historically contributing structures on the property.

During December of 2002 and January of 2003, a research team commissioned by Fairfax County undertook a survey of all buildings located on the former Lorton Prison property. Most of the contributing structures are located within the Reuse and Redevelopment Areas of the site, the following section describes the structures that are within the park property.

Nike Control Site

Buildings in this complex range in age from 1954 to 1982, with the majority of the buildings being built in 1954. Most of the buildings are constructed having a one way pitched roof supported by concrete masonry load bearing exterior walls. Most of these buildings are narrow being one to two rooms deep. The majority of the buildings are in fair to good condition. Currently, the Facilities Maintenance Division of Fairfax County Government is occupying several buildings in this complex. These buildings were designed for utilitarian administrative uses with some open dormitories. They could serve similar purposes in the future.

Nike Missile Launch Site/ DC Corrections Minimum Facility

Buildings in this complex range in age from 1954 to 1995, with the majority of the buildings being built in late 1980s to early 1990s. Most of the buildings are constructed of metal siding on a steel structure commonly known as “Butler Buildings”. These facilities are capped and sealed in concrete. The only appearance of these facilities is large concrete pads with 4-inch raised lids and welded metal plates to cover the vertical entrances. The buildings are arranged around a central quadrangle yet they are not well integrated to the site or with each other. The majority of the buildings are in fair to poor condition with several roof leaks, some of a substantial nature. The facilities appear to have been built quickly out of necessity with little to no aesthetic value. There is a gymnasium within the complex that seems to be in good condition but there is currently no natural light and it is not a welcoming place. To the west of the complex are two administrative buildings for the Nike Missile Launch Site built in 1954.

Dairy Farm

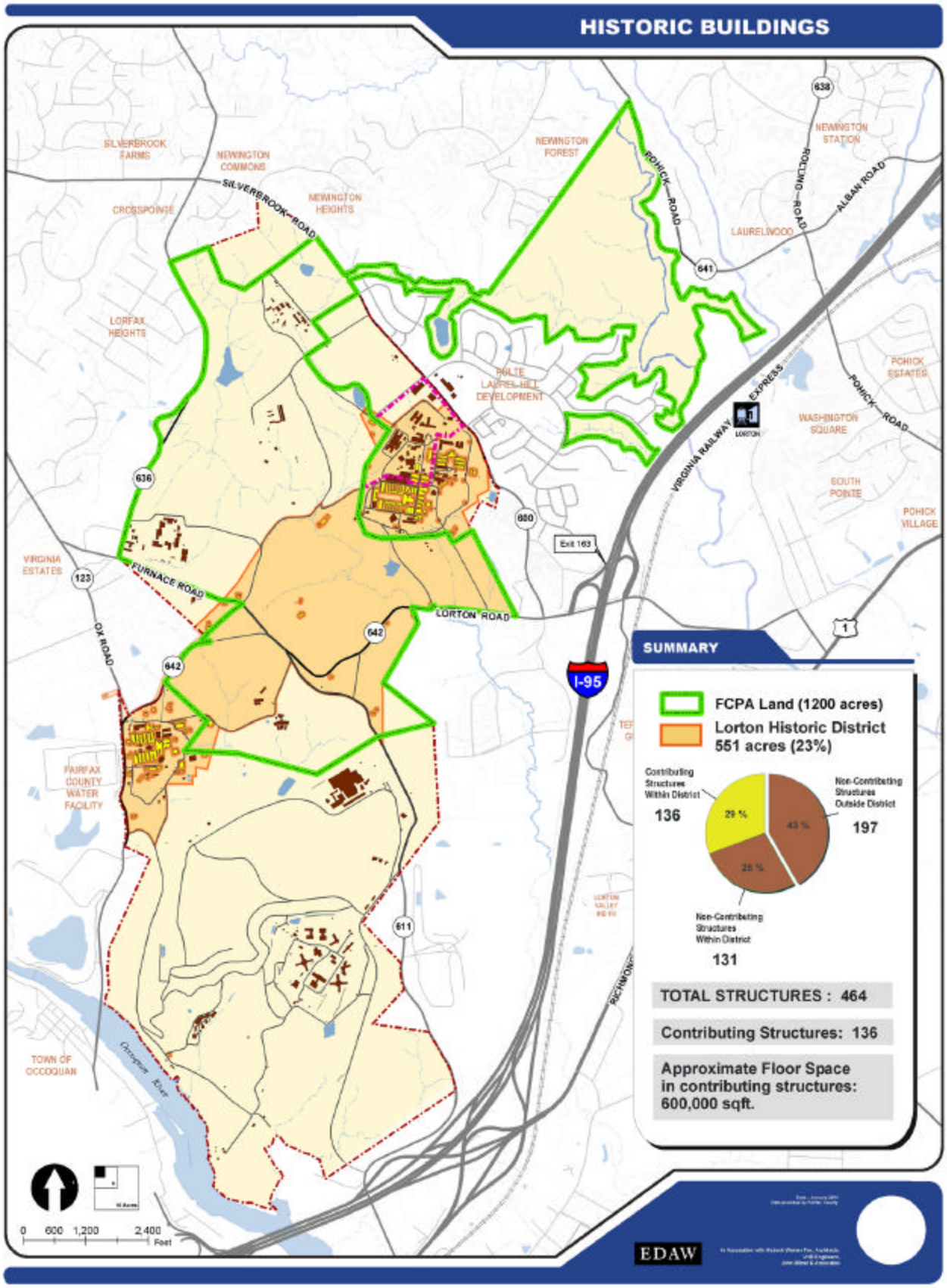
Buildings in this complex were built in the early 1960’s. This was a fully functioning dairy farm with a mechanical milking system. The barns on this site range in size and shape depending on their use. Most of the barns are built of metal roof on wood truss structure and are open on several sides. The larger barns are metal roof on metal structure. The majority of the barns are in fair to good condition. There are two concrete grain silos in the complex that appear to be in good condition.

The milking facility however is in very poor condition and will require a major investment to reuse. These buildings are of such a specific use there is not much that these buildings could be used for other than for agricultural purposes.

Laurel Hill House

The Comprehensive Plan language states that "The Laurel Hill House and its gardens should be designated as a heritage resource area within the Countywide Park with a minimum of 20 acres to ensure that these resources are adequately conserved and protected."

Figure 13: Contributing Structures



3.2.10 Site Archaeology

An archaeological sensitivity assessment report was prepared as a part of the Environmental Assessment of the transfer of the property. This assessment addresses the potential for significant archaeological resources in the Lorton Property. An archaeological sensitivity model was developed to identify areas that have been disturbed. The study also considered information from previous studies in the vicinity; field visits; and GIS data on topography, known disturbance and current land use. Based on this information, maps were developed showing areas of archaeological sensitivity in areas designated for development that warranted archaeological testing. Four factors were considered in developing the predictive model: degree of disturbance /development, distance to water, locations of previously recorded archaeological sites, and locations of historic structures. Following the model, areas were designated as low, moderate, or high sensitivity.

Areas were identified that are likely to experience high levels of disturbance through construction or redevelopment. Areas designated for parks or passive recreation were considered medium disturbance. Low disturbance areas are designated for preservation; historic sites designated for adaptive reuse and currently developed areas that are not likely to be subject to further development.

Moderate and high sensitivity areas were recommended for Phase I archaeological survey, following the guidelines of the Virginia Department of Historic Resources (shovel tests at 15-m intervals for high sensitivity; 30-m intervals for moderate sensitivity areas) Areas of archaeological sensitivity were overlaid on areas of proposed land disturbance and development. Areas with moderate and high sensitivity and medium or high future land disturbance were recommended for survey; areas with low sensitivity were not recommended for survey (G&O 2000:18).

Phase Ib archaeological survey was conducted of 418 acres of the 2,709-acre Lorton Property. These areas were designated moderate or high archaeological sensitivity and medium or high potential for future ground-disturbing or development activity. The field team excavated 2,528 shovel tests, recovering 2,030 artifacts (438 prehistoric and 1,592 historic). No prehistoric or historic cultural features were identified. Thirty-six archaeological sites were identified, five prehistoric, five historic, and 26 multicomponent prehistoric and historic sites. Two of the multicomponent sites were previously recorded. Fifty-two isolated finds were identified (Furgerson et al. 2002:i).

Analysis of the recovered artifacts concluded that none of the 36 archaeological sites is likely to contribute important information on the historic or prehistoric past, and therefore no sites were deemed eligible for the National Register of Historic Places and no additional work was recommended (Furgerson et al.2002:i). The Virginia Department of Historic Resources concurred with the conclusions and recommendations of the assessment.

The Lorton Exchange Tract, a 235-acre tract north of Silverbrook Road, was surveyed for the Bureau of Land Management. The archaeological survey included the excavation of 2,221 shovel tests and pedestrian survey yielding 2,593 artifacts. One cultural feature, an unfinished twentieth-century brick structure, was identified. Sixteen sites were identified, two of which were previously recorded. Two are historic sites; the rest are prehistoric sites. Presence of cultural features, integrity, artifact density, and rarity of resource were considered in evaluating the significance of the

sites. Only two sites (44FX2485 and 44FX2487) were evaluated as potentially eligible for the National Register. Phase II evaluation was recommended (Hill et al. 2000:iv). Archaeological assessment of the Meadowood Farm study area resulted in the recommendation for intensive Phase I archaeological survey (Hill et al. 2000:v).

When the master plan team began work on Laurel Hill, it was understood that areas of moderate and high archaeological sensitivity and medium or high future disturbance had been surveyed and had not yielded significant archaeological resources. A Park Authority Archaeologist identified an area at the northwest side of the Central Facility Redevelopment area that appeared not to be disturbed but within the area to be developed. Further review by Park Authority Archaeologists raised other questions about tested areas and identified resources. While acknowledging that the federal and state standards had been met, Park Authority archaeologists recommended additional survey to add to their knowledge of the extent and nature of the identified sites.

Both the untested area at the northwest of the Central Facility and the proposed high school property were plowed and subjected to controlled surface collection. One previously identified site (44FX2570) was determined to extend into the untested area. Several other sites were located in the high school property. Site 44FX2570 may warrant additional investigation. The information gathered on the sites in the high school property is thought to be adequate to understand their extent and nature. County archaeologists recommend plowing and controlled surface collecting of the intermediate school property.

The area within the National Register Historic District was not subject to archaeological survey. Prior to any ground-disturbing activity in the Historic District, archaeological studies must be conducted. Provisions for archaeological survey, testing and data recovery excavations are stipulated in the Memorandum of Agreement that has been drawn up for the property.

3.3 Summary of Opportunities, Constraints and Issues

A summary of opportunities and constraints for the park land was developed at the beginning of the planning process (see Figure 14). This summary is based on the preliminary site analysis, and the established land use designations identified in the comprehensive plan.

Considerations for site suitability included unsuitable slopes; as well as parcel size, shape and configuration. The intent of identifying these constraints is to preserve mature or sensitive wooded areas by promoting passive activities in sensitive or unsuitable areas with minimal disturbance. This serves to keep vegetative coverage intact for preservation as a limited site resource. The purpose of this analysis is to summarize the sections of land which are most suitable for active recreation and higher intensity use at Laurel Hill Park.

As described in this document, the total area for Laurel Hill is 3,200 acres. This includes a number of areas that have been designated for specific uses including:

- Two School Sites (117 acres)
- Landfill (503 acres)
- Cemetery / Fire and Rescue Site (21 acres)

- Graduated Care Development (49 acres)
- Reuse Areas (138 acres)

Based on these uses and acreage allocation, there are approximately 1,632 acres identified for park uses. The additional 12 acres in this calculation are comprised by the two ball fields located within the reuse areas (Central Max and the Occoquan Workhouse Facility).

Within the park land, two areas are already in use for recreation or under construction. These include the public golf course (280 acres) and the existing NVRPA active recreation areas (42 acres). The remaining 1,310 acres of land include a number of development constraints. These constraints limit the type of active recreation development that can occur although it is feasible to located passive recreation uses such as trails within these constrained areas. The constraints include:

- 100 year flood plain
- Wetlands
- Resource Protection Areas
- Wooded Areas
- Steep Slopes

When these areas are combined they account for approximately 880 acres of the remaining 1,310 acres which leaves approximately 430 acres of land that can be developed for active recreation uses. **See Figure 14.**

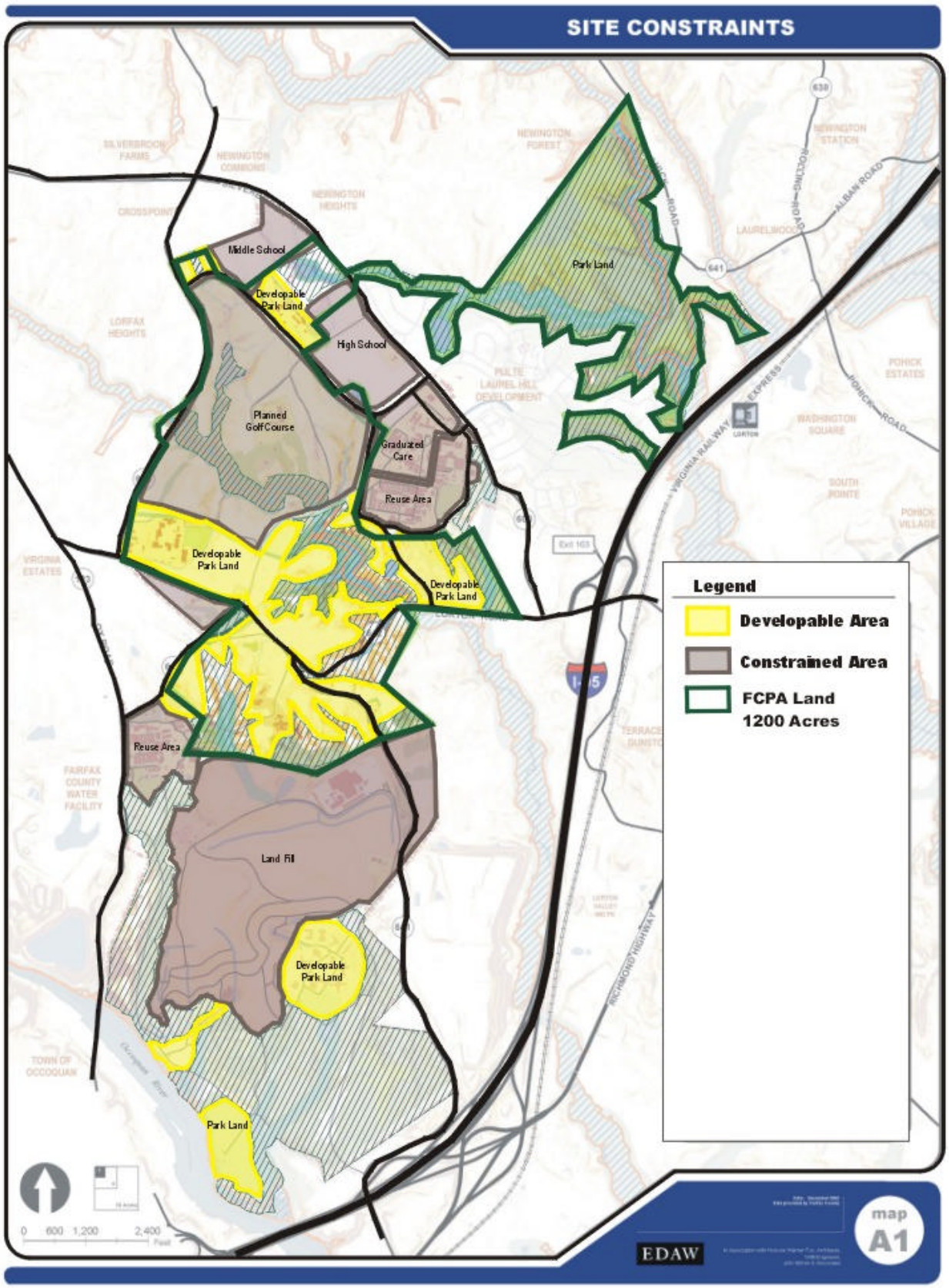



Figure 14: Summary of Opportunities and Constraints