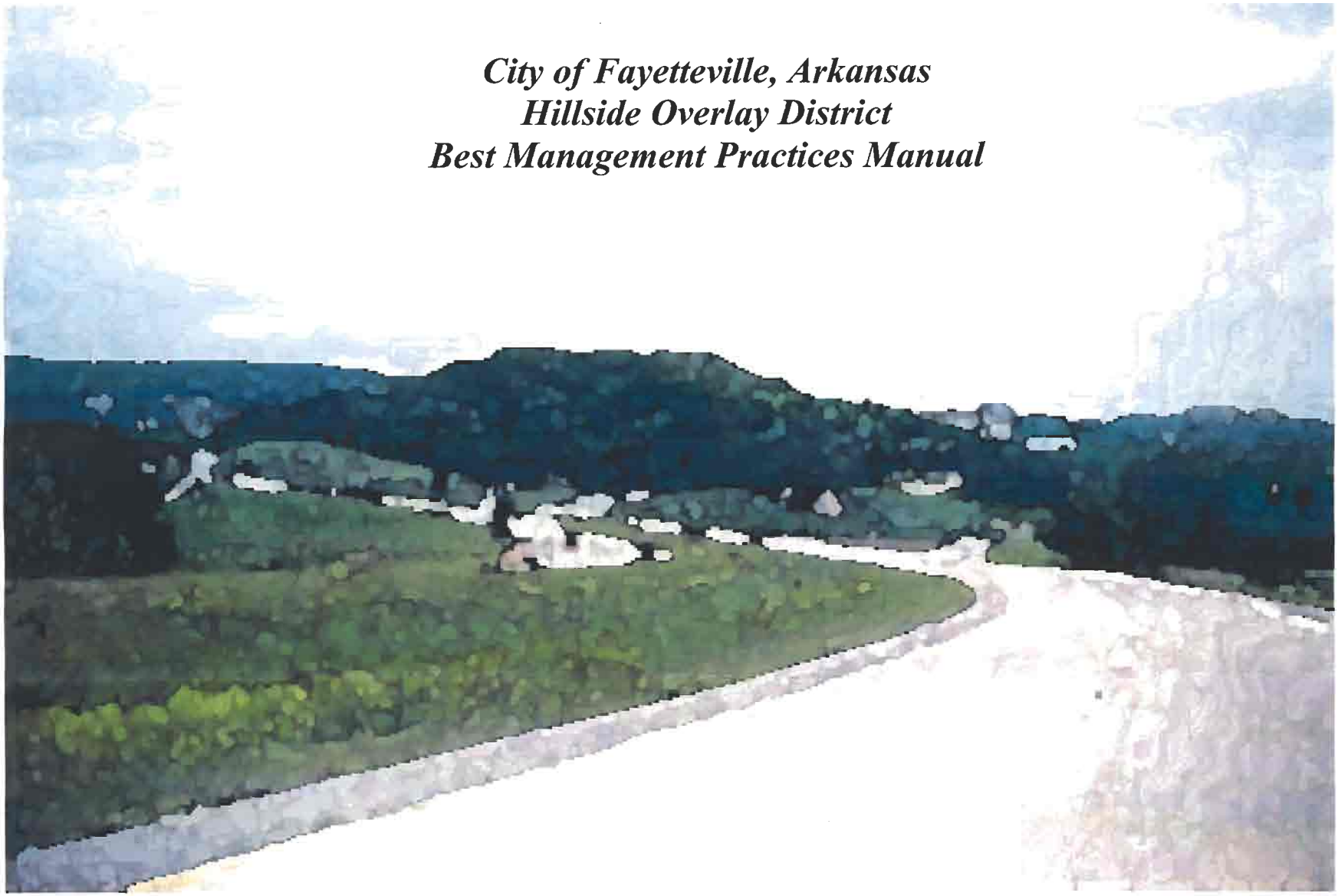
City of Fayetteville, Arkansas
Hillside Overlay District
Best Management Practices Manual



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I. Background and Introduction

The Fayetteville City Council adopted Resolution Number 130-02 in August of 2002, requesting that the Planning Commission conduct a rezoning study and zoning map amendment for those areas shown as R-2 (Medium Density Residential, RMF-24) that have 15% or greater slope.

A Hillside Task Force was developed and comprised of Planning Commission Members. The Hillside Task Force examined studies conducted by staff on the existing development patterns of Mt. Sequoyah, adopted hillside ordinances from other cities, and recommendations proposed by Planning Staff. Unable to reach consensus on a hillside development ordinance and boundary map, the Hillside Task Force was disbanded in the fall of 2004.

In 2005, a new Hillside Task Force was developed comprised of members of the City Council and the Planning Commission. A series of meetings occurred that provided the Task Force with a background of past ordinance proposals and ongoing public input. Ultimately, a recommendation and ordinance was developed by Planning Staff and the Task Force.

Due to on-going discussions and concerns expressed by both the development community and the public as a whole, Staff proposed that a consultant familiar with steep slope development be hired to assist City Staff in developing a hillside development ordinance.

In March of 2005, the Fayetteville City Council authorized a contract with Design Workshop of Asheville, North Carolina to assist the City in the drafting of a Hillside Development Ordinance and *Best Management Practices Manual.*

This *Best Management Practices Manual* is designed to illustrate best development practices that are deemed as appropriate for development on our steeply sloped and heavily forested hillsides. This manual, in conjunction with the City Ordinances that have been amended such as: Chapter 161-Zoning, Chapter 167 – Tree Preservation, Chapter 169 – Physical Alteration of Land, Chapter 170 – Stormwater, Drainage, and Erosion, and Chapter 172 - Parking, will be the implementing and regulating documents guiding all development that falls within the Hillside Development Overlay District.

II. Concerns Expressed During Public Input Sessions

City Staff and Design Workshop held two public input working sessions in June and July of 2005.

During the first work session in June we conducted a meeting with the members of the Hillside Task Force, interested developers, and an open public input meeting. These work sessions focused on gathering input and feedback regarding existing conditions and the future of Fayetteville's hillsides. The following topics were discussed in order to:

1. Identify issues and concerns based on the current and future development of Fayetteville's hillsides.

2. Confirm the existing environmental, development, zoning and regulatory conditions.

3. Discuss best practices of development seen in the City or region.

4. Discuss the visual preference for hillside areas in and around Fayetteville.

5. Gain feedback regarding current development trends and best current practices.

6. Find common ground between all parties.

7. Discuss the proposed Unified Development Code revisions.

During the second work session in July of 2005 we again conducted meetings with the Hillside Task Force, interested developers, and a general public input meeting. These work sessions focused on:

1. Confirming the project approach.

2. Reviewing the information gathered in the first work sessions.

3. Developing a process for establishing recommendations.

4. Reviewing the existing codes regarding development.

5. Drafting Best Practices guidelines to be used in the manual.

6. Reviewing recommended changes to the development code.

Summary of Concerns with Development on Hillsides as Expressed by the Public.

Density:

- Infill of inconsistent housing types / increased density in established neighborhoods
- Do not use downzoning as a tool for preserving trees

Storm water / Infrastructure:

- Drainage ditch design, adequate capacity, and proper location
- Need additional storm water regulations along with better enforcement
- Inadequate or outdated infrastructure in older neighborhoods
- Utility companies to allow for design flexibility

Tree Preservation:

- Preserve the natural character of the hillsides

- Protect ridge tops and significant plant communities
- Limit the amount of disturbance to preserve trees and help manage storm water erosion
- Viewshed protection
- Protect virgin and biodiverse plant communities

Views of the Hillsides:

- Preserve the visual quality of the most frequently seen hillsides
- Long range views draw people to naturally want to reside on hillsides

Development / Planning Practices:

- When development happens, do it correctly. Do not sacrifice quality – good development sells
- Do not stifle creativity or require a homogenous product
- Create the opportunity for development flexibility and diversity of product type

Ordinance / Implementation:

- Ordinances should be implemented on a lot by lot basis
- New or revised ordinances should be clear and not over burdening
- Hilltops should be included in the hillside ordinance study
- Hilltops may need separate design criteria to be effective
- Ordinance and regulatory restrictions and processes should be placed on individual lot developments of less than one acre

Geologic Study / Conditions

- Geotechnical reports should be prepared for each lot located in the Hillside Overlay District.
- Engineered foundations should be a requirement in the Hillside Overlay District.

Tree Function

- Trees should be recognized for their function in stormwater filtration and absorption and not just for their aesthetic qualities.

III. Existing Conditions

- **Regulatory Codes:**

What parts of the current codes are consistent with hillside preservation?

- Physical Alteration of Land (Grading)
- Stormwater Management, Drainage, and Erosion Control
- Tree Preservation and Protection

Where do the existing codes fall short?

- Current zoning code is designed for flat land development
- Height limitations, setbacks, lot size and lot layout design
- Grading ordinance does not address innovative ways to retain grade with home design

What are the loop holes in the current regulatory codes?

- New development less than one acre in size is generally exempt from many development requirements
- Tree preservation is not required on single lot development
- Tree preservation is required of the developer at the time of platting; however, lot owners and builders may remove preserved tree canopy from their individual lots

Code Revision Process:

The process outlined below illustrates the steps taken by the City, the Hillside Task Force and Design Workshop to specifically revise the current codes.

1. Review the existing conditions and define the Hillside Overlay District Map.
2. Test and review the current development codes to determine the loopholes in the current codes:
   - Zoning
   - Grading
   - Tree Preservation
   - Erosion and Sediment Control
   - Parking
3. Amend the current Unified Development Ordinance Codes to be more conducive to hillside development.
4. Create a Hillside Overlay District Best Management Practices Manual.

- **Zoning:**

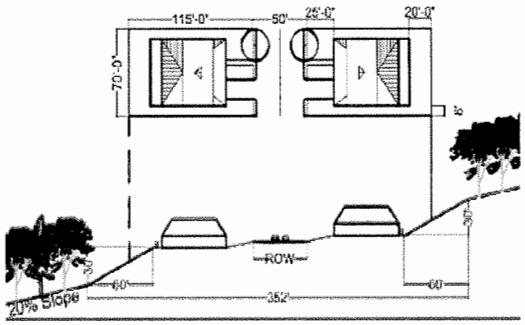
To examine existing zoning codes, Design Workshop created plans and sections illustrating minimum allowable lot size, maximum allowable building footprint, and front, side, and rear setbacks. The analysis revealed that existing lot conditions do not promote sound development practices with respect to preserving tree canopy, preventing erosion, and protecting views both to and from the hillsides. The existing setbacks contribute to excessive land disturbance. Grading for roads and right-of-way coupled with large front building setbacks creates additional potential for land disturbance.

The following illustrations summarize each of the major zoning classifications found on Fayetteville's hillsides. These studies depict the pattern of development per the current zoning regulations, in plan view and cross-section, illustrating the potential impact when applying the current development codes to lands on an average 20% slope. Also summarized is a diagram

illustrating the maximum allowable density on one acre of land.

Existing RSF-4 Single Family

RSF 4 SINGLE FAMILY

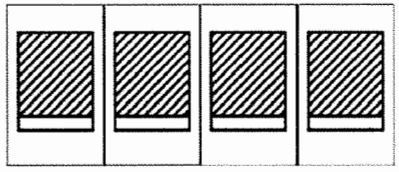


EACH LOT = 8,050 SQ FT (70 WIDTH X 115 LENGTH)
SETBACKS:
FRONT 25
BACK 20
SIDE 8

BUILDING FOOTPRINT (ACCORDING TO SETBACKS) = 3,780 SQ FT (54 WIDTH x 70 LENGTH).

ZONING ONLY ALLOWS FOR 40% COVERAGE (8,050 X .4) = MAX 3,220 SQ FT FOOTPRINT (60 WIDTH x 54 LENGTH).

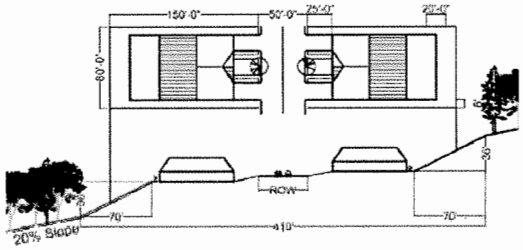
THIS DIFFERENCE CREATES A 560 SQ FT POTENTIAL DEVELOPMENT ZONE WHICH IS FRONT BACK/FLEXIBLE.



1 Acre

Existing RSF-4 Two Family

RSF4 TWO FAMILY

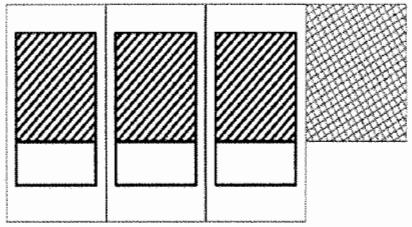


EACH LOT = 12,000 SQ FT (80 WIDTH X 150 LENGTH)
SETBACKS:
FRONT 25
BACK 20
SIDE 8

BUILDING FOOTPRINT (ACCORDING TO SETBACKS) = 6,720 SQ FT (64 WIDTH X 105 LENGTH).

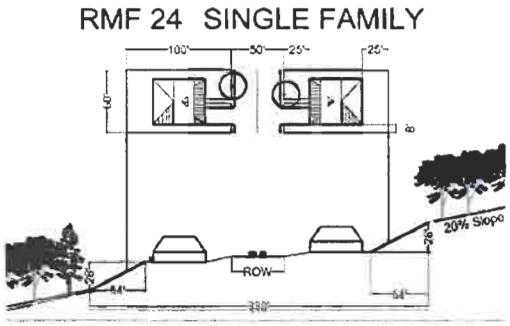
ZONING ONLY ALLOWS FOR A 40% COVERAGE (12,000 X .4) = MAX 4,800 SQ FT FOOTPRINT (64 WIDTH X 75 LENGTH).

THIS DIFFERENCE CREATES A 1,920 SQ FT POTENTIAL DEVELOPMENT ZONE WHICH IS FRONT BACK/FLEXIBLE.

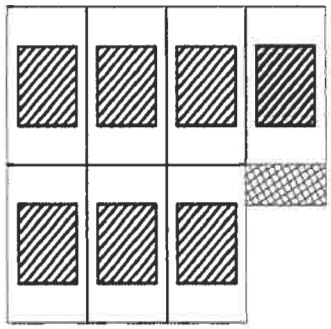


1 Acre

Existing RMF-24 Single Family

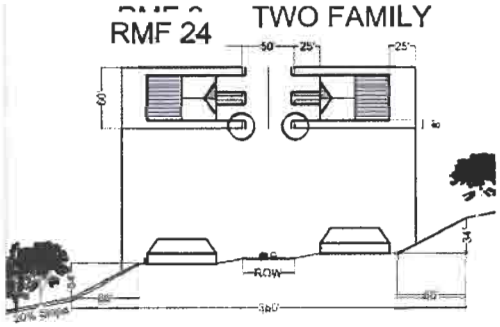


MIN EACH LOT = 6,000 SQ FT (60 WIDTH X 100 LENGTH)
SETBACKS:
FRONT 25
BACK 25
SIDE 8
HOUSE SIZE = 2,200 SQ FT HOUSE SIZE
SETBACKS INCREASE WHEN HEIGHT EXCEEDS 20 FT

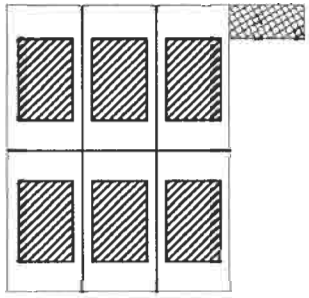


1 Acre

Existing RMF-24 Two Family

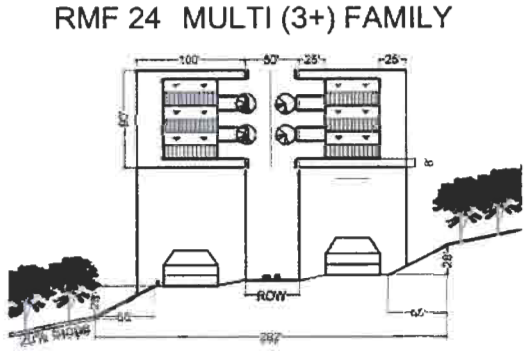


MIN EACH LOT = 7,000 SQ FT (60 WIDTH X 116 LENGTH)
SETBACKS:
FRONT 25
BACK 25
SIDE 8
HOUSE SIZE = 2,934 SQ FT HOUSE SIZE
SETBACKS INCREASE WHEN HEIGHT EXCEEDS 20 FT

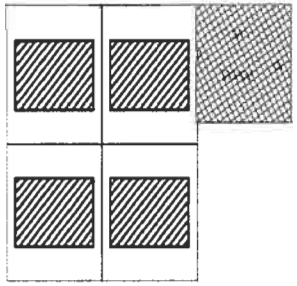


1 Acre

Existing RMF – 24 3+ Family



MIN EACH LOT = 9,000 SQ FT (90 WIDTH X 100 LENGTH)
SETBACKS:
FRONT 25
BACK 25
SIDE 8
HOUSE SIZE = 3,700 SQ FT HOUSE SIZE
SETBACKS INCREASE WHEN HEIGHT EXCEEDS 20 FT

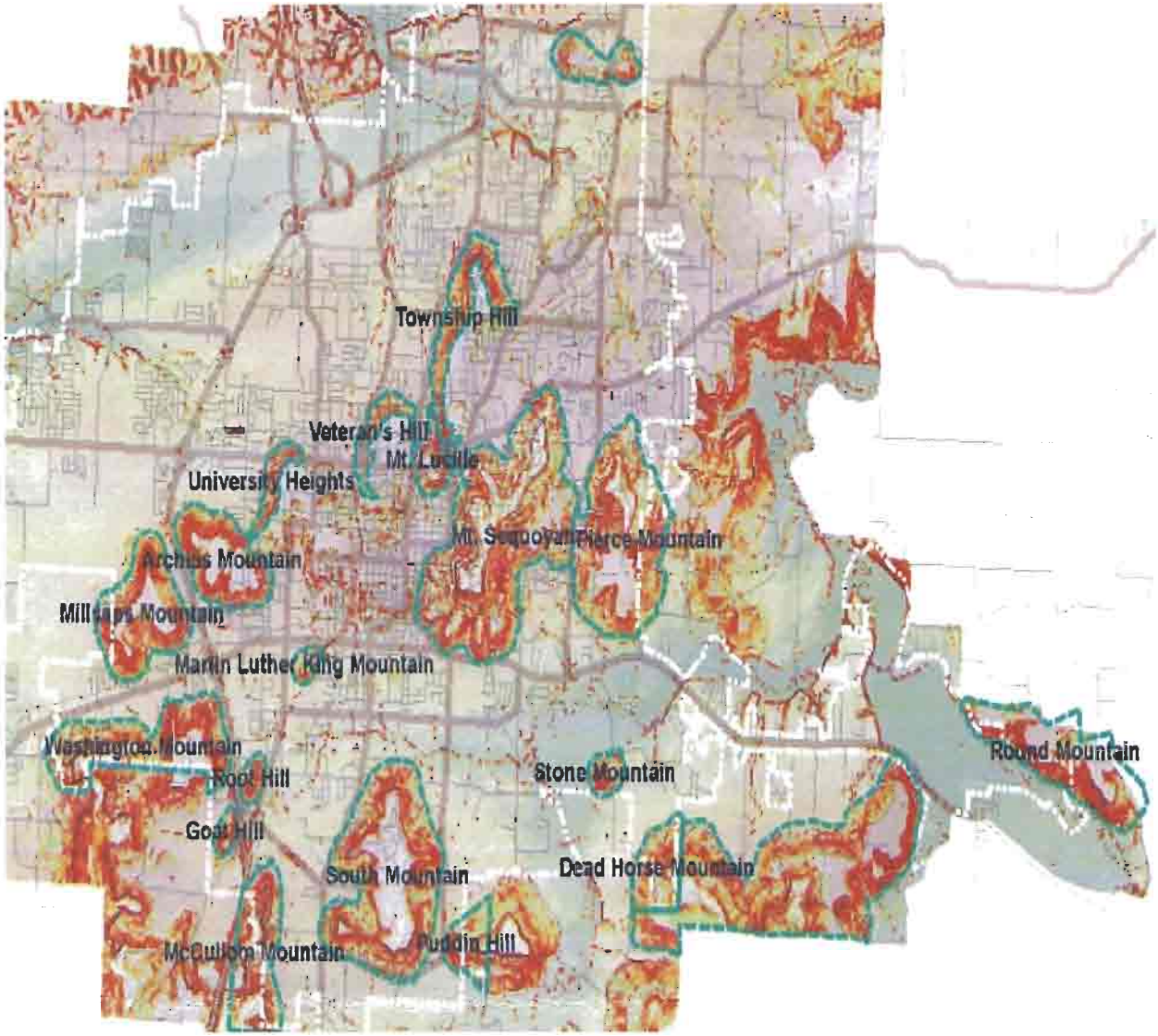


1 Acre

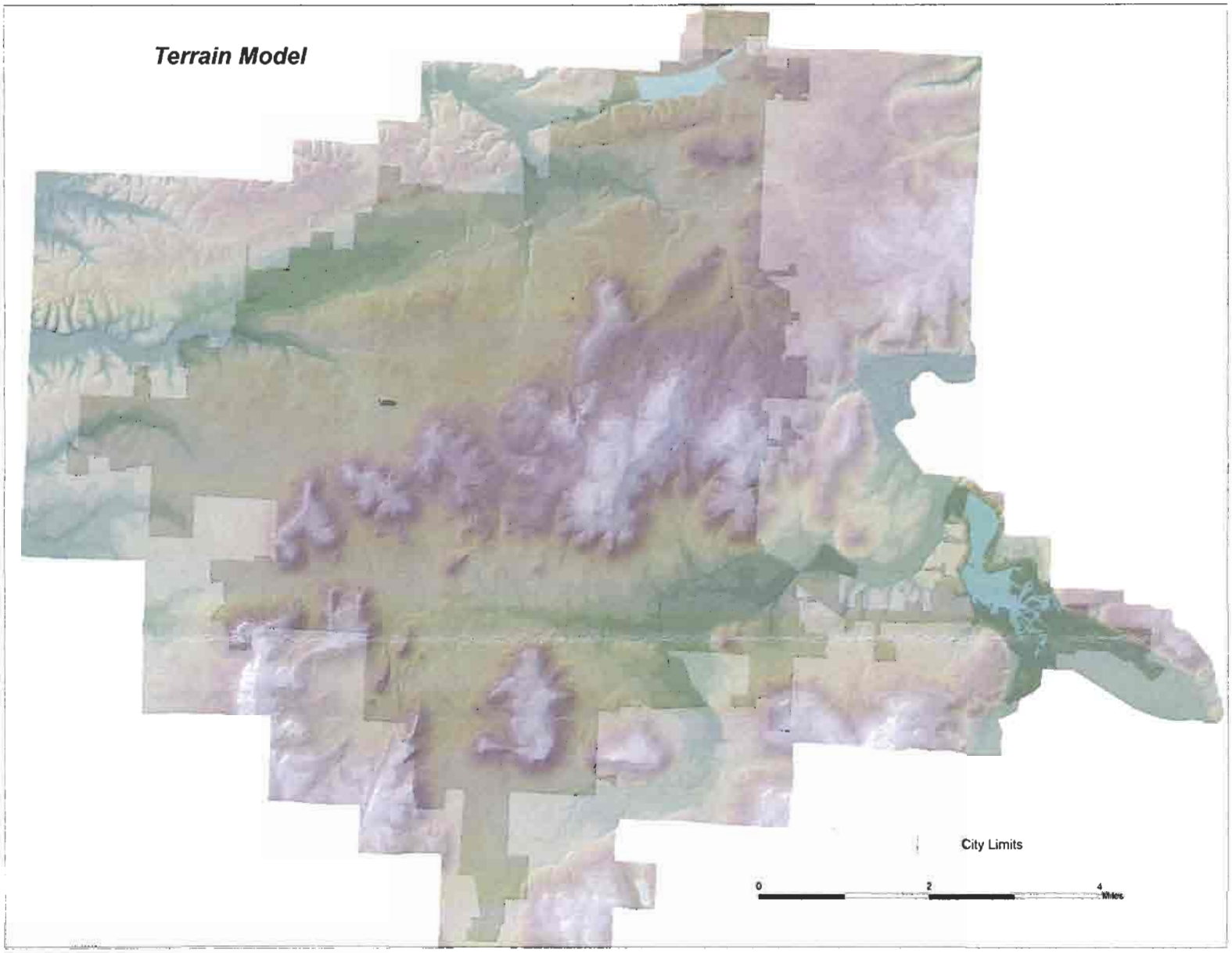
- **Existing Slopes:**

Understanding the topography of the City allows us to clearly delineate where the hillsides exist and which hillsides are most sensitive to development. The perception is that the hillsides are a constant and consistent slope when viewed from afar. On the contrary, hillsides have diverse landforms; some areas are flatter and some are steeper. There are also flat hilltops as opposed to peaks or ridges in many cases. It is important to analyze the hillside topography in order to understand and illustrate the diversity of hillsides so that the City, the public, and developers know which areas require more scrutiny and which hillsides allow more development freedom.

The map following indicates the areas of the hillsides where the slopes greater than 15% occur. Areas that are yellow indicate slopes that are moderately sensitive with slopes between 10-15%. Areas that are green are less than 10% slope.



Terrain Model Illustrating the Hillside Areas in Fayetteville. *{City of Fayetteville 2005}*



- **Geologic Hazards:**

Based on a 2001 report by King published in the Journal of Arkansas Academy of Science, much of the Fayetteville area is located on shale strata containing swelling clays. These clays weather rapidly and form expansive soils. These soils swell and shrink depending on the variation of moisture content within the clay. The nature of these soils with their swelling and shrinking can cause heaving, cracking, water seepage and rotting of wood building components. They also cause subsidence in paving areas, excessive runoff after rain events, down-slope creep and the slumping of steep slopes. Although there are many solutions to these problems, they can be very costly to install and remediate after construction. Often the cost of remediation for foundation problems post-construction can exceed 10-25% of the assessed value of the home. The detrimental effects of construction on hazardous soils can be mitigated by property owners' access to a detailed geotechnical report conducted on the building lot. A geotechnical report will give lot owners and builders an understanding of the soil conditions as they relate to the specific property. Mitigation of soil inadequacies can then be explored, which may entail a need for engineered foundations, slip foundations, or other methods or construction techniques that will ensure that structures are built in an appropriate manner.

Expansive Soil hazards in the Fayetteville Quadrangle:

1. Lower Fayetteville Shale: Located mostly on the flatter or slightly sloped hillsides, this soil covers an expansive (45.5%) area of the Fayetteville Quadrangle. *The weathered clay horizon of this unit ranges from 0 m to 10 m thick and rests on top of the un-weathered shale. Adverse effects associated with construction on the lower Fayetteville shale are differential subsidence of pavements resulting in extreme cracking and unevenness, cracking of foundations and retaining walls, cracking of concrete floors, cracking of concrete driveways, separation of concrete floor seams, rotting of wooden floors and other wooden components of houses, various breaks in masonry above the foundation, runoff from heavy rain fall, seeps emerging from paved areas, seeps emerging in houses between concrete floor seams, and corrosion of buried pipes. With the expansion and contraction of the lower Fayetteville Shale clays, even areas with very gentle slopes display evidence of creep.* (King, 2001).

2. Upper Fayetteville Shale: Located primarily on moderately steep slopes. The upper Fayetteville Shale has a much smaller aerial extent (4.7%) than the lower Fayetteville Shale. This soil is susceptible to creep and slumping. The area of contact between the Upper Fayetteville Shale and the Wedington Member is also the location of frequent springs and seeps.

3. Woolsey Dye: Located on moderate slopes. Hazards are cracking, creep, and slumping. This soil weathers into a soft gummy clay. The area of contact between the Woolsey Dye and the Brentwood Member is the location of frequent springs and seeps.

4. Trace Creek Member: This soil is a black, organic rich shale at the base of the Atoka Formation. The Trace Creek Member has an outcrop extent of 1% in the Fayetteville Quadrangle.

The only inhabited area on the Trace Creek Member in the City of Fayetteville is a residential neighborhood on Mount Sequoyah. On exposure, the Trace Creek Member weathers quickly into expandable clay subject to slumping. (King, 2001).

Conclusions:

Paleozoic shale strata are exposed over more than 50% of the Fayetteville Quadrangle. These shale units are known to weather to expansive soils, creating numerous problems for construction. Damage to structures associated with expansion and contraction of weathered clays within these units costs hundreds of thousands of dollars annually to and unsuspecting public. Many of these costs (particularly those related to repair of damaged home or business foundations) are not protected by homeowners' or businesses' insurance.

Detailed mapping of these clay-rich strata provides an aid to identifying and mitigating these potential hazards. Knowledge of the areal distribution of hazardous stratigraphy in the Fayetteville Quadrangle may reduce the overall costs of ***mitigation through incorporation of appropriate engineering solutions during construction yielding improved building design, better building quality, and lowered building repair costs. Thus, geologic mapping of the Fayetteville Quadrangle is relevant and valuable to city planners and developers.*** (King, 2001).

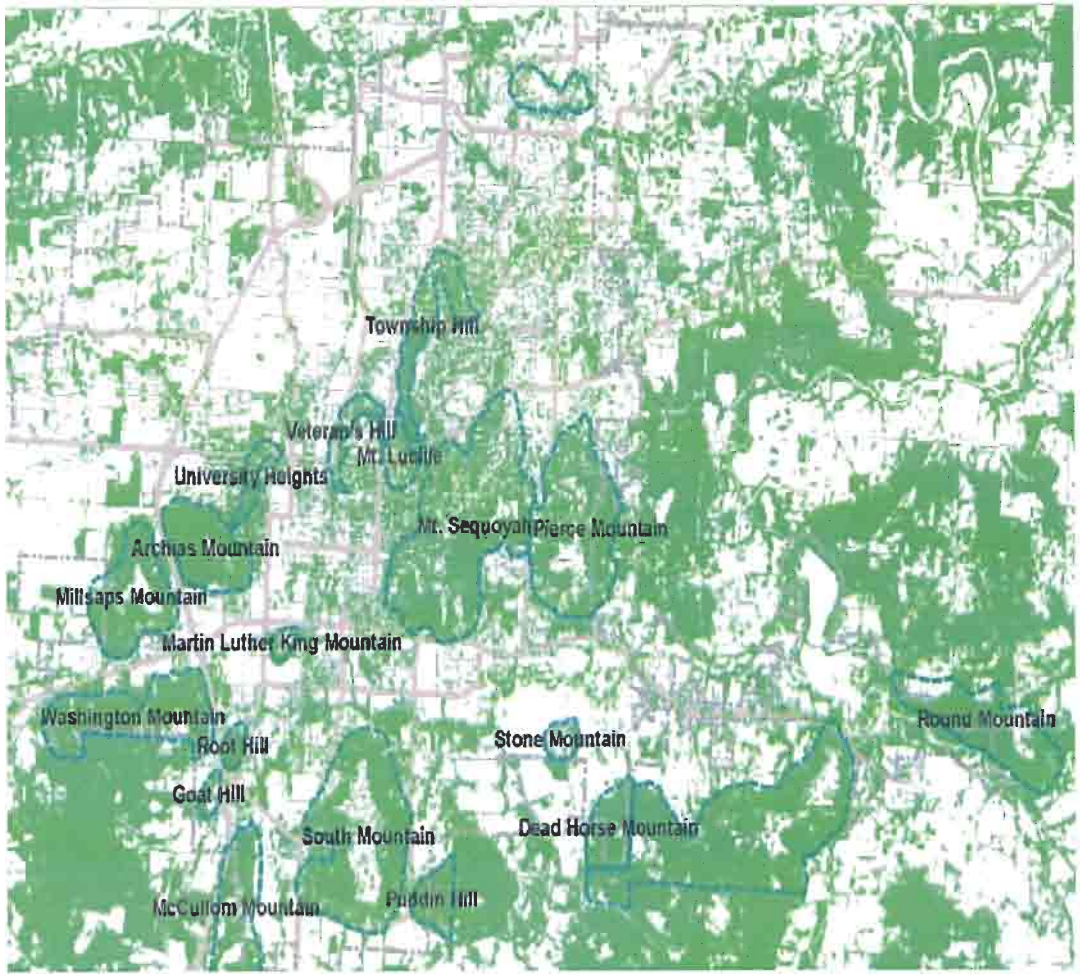
Individual lot owners in the Hillside Overlay District are encouraged to have a footing and foundation plan designed by an Arkansas registered engineer. An engineered solution utilizing proper methods and techniques for mitigating hazardous soils is the property owners' best insurance against future foundation failure.

A detailed soils map is available at the City of Fayetteville Planning Office located at 125 W. Mountain St.

- **Tree Canopy:**

Currently, the undeveloped hillsides in Fayetteville are predominantly covered with trees, and are visually perceived to be predominantly tree covered. This tree cover is highly visible because the hillsides rise three to four hundred feet above the surrounding area and are very visible from many areas within the city. Any tree cover that is removed for development is usually visible and typically brings attention to the project and the development process. Tree cover removal may disrupt the natural ecosystems, change the hydrologic characteristics of the hillsides, and potentially increase the impacts of erosion and soil instability.

The following map illustrates the distribution of existing tree canopy, indicated in green.



Tree Canopy Cover for the City of Fayetteville, AR. {*City of Fayetteville 2003*}

IV. Best Practices

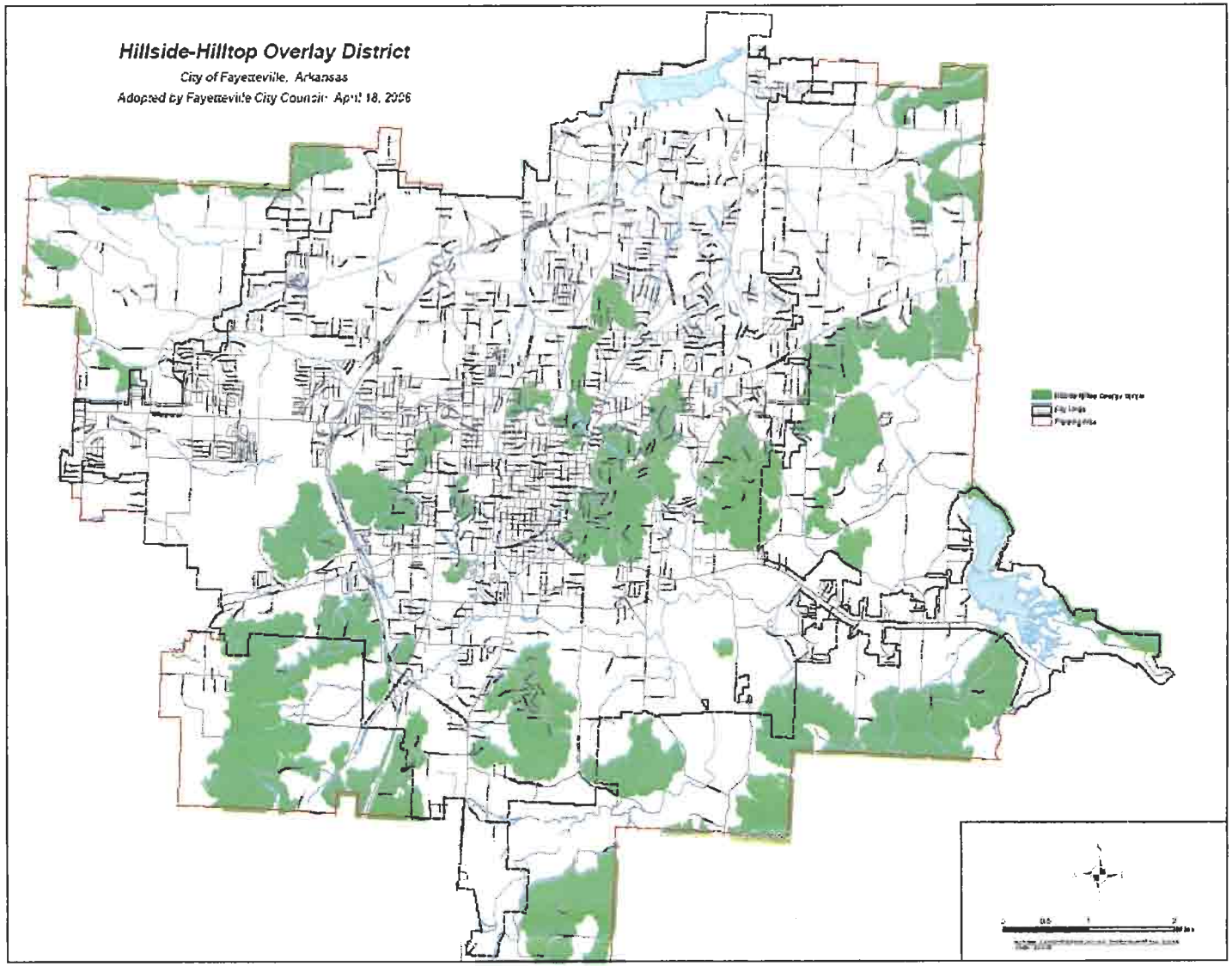
A. Subdivision Development

- **Hillside Overlay District:**

The Hillside Overlay District has been delineated by analyzing multiple layers of information. Through this analysis, the Hillside Overlay District area has been defined based on analysis of steep slopes, areas of high visibility, location of existing tree canopy, and geologic conditions. The review and testing of the current City codes confirm that many of the current codes are not compatible with creating a responsible development pattern on the hillsides. Since the current codes were created to guide development on flatter ground, the identified Hillside Overlay District provides a more appropriate set of criteria that better responds to the patterns and practices of hillside development.

A Hillside Overlay District map was generated using the City's Geographic Information System (GIS).This map was created using a mathematical model developed by the Information Technology Department.

A detailed map of the Hillside Overlay Districts is available at the City of Fayetteville Planning Department, 125 W. Mountain St., Fayetteville, AR. 72701. 479-575-8267.The following map is for representative purposes only and should not be used as a guide for specific properties located within the City.



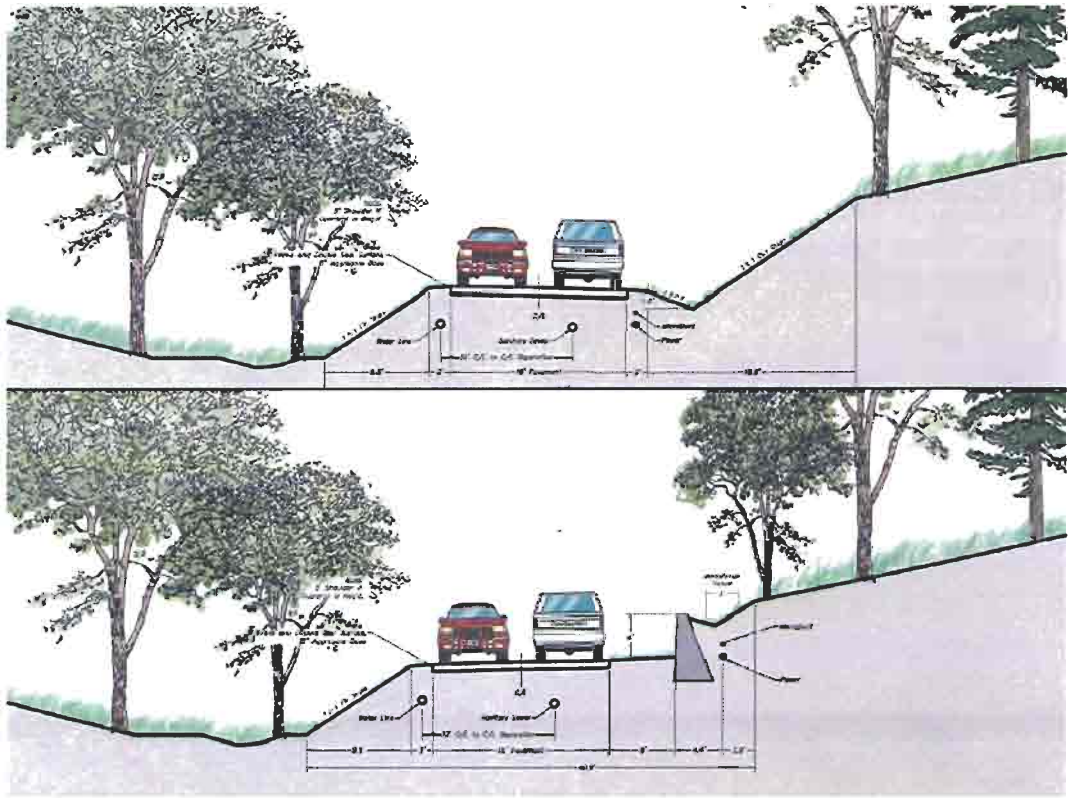
Hillside Overlay District Map *{City of Fayetteville. 2006}*

- **Right of Way Design and Road Grading:**

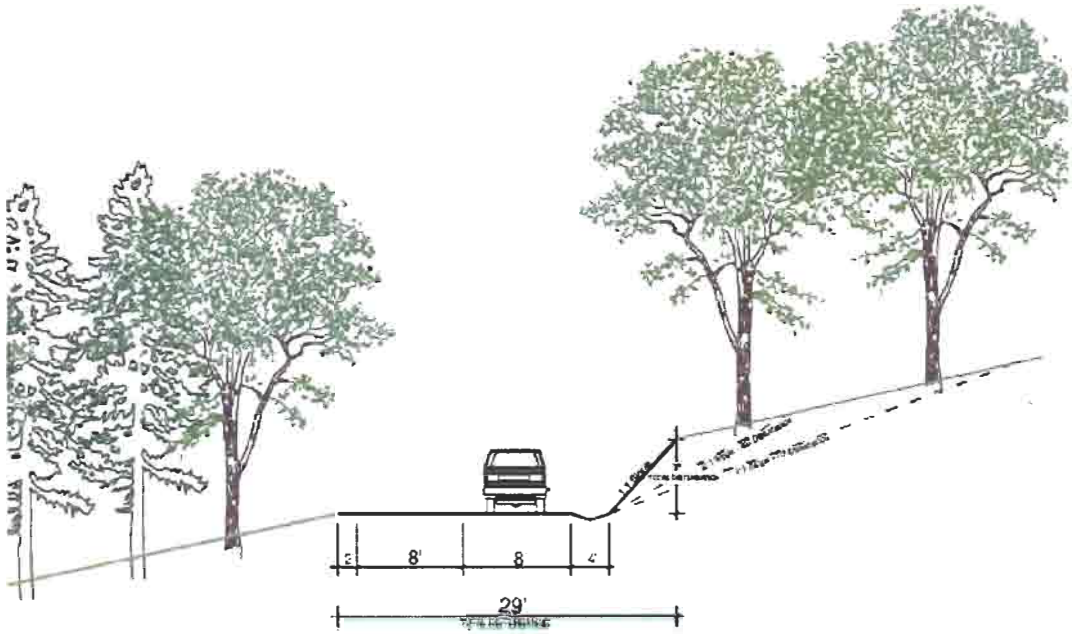
The primary goal for the design of street right-of-way within the Hillside Overlay District is to minimize its width in order to minimize the amount of grading disturbance and tree removal while still accommodating utility locations, vehicular and pedestrian movements, and / or parking.

Streets located within the Hillside Overlay District should have the right-of-way determined as back of curb to back of curb, or back of sidewalk to back of curb. These right-of-ways should be comprised of the following components:

1. All streets should be either 22 or 24 feet back of curb to back of curb.
2. Minimum sidewalk width of 5 feet.
3. Sidewalks located only on one side in steeper more constrained areas.
4. Storm drainage with on street storm drains in areas with sidewalks.
5. Drainage swales in areas, on uphill side, where sidewalks do not exist.
6. Building setbacks measured from back of curb / back of sidewalk (ROW).
7. Water, sewer, and storm-water utilities located within the ROW and they are encouraged to be located under the roadway.



These two diagrams illustrate the amount of disturbance in the right-of-way which can be minimized with a retaining wall or plinth located on the upslope side of the street.



20% SLOPE

Illustration of a 1:1 tieback slope greatly reducing the amount of disturbance.

Roadway Grading:

Steeper tie-back slopes and roads created in all cut, rather than a cut-fill balance, promote better screening by preserving the trees on the downhill side and utilizing less compaction of fill material.

- **Location of Utilities:**

It is the intent to accommodate utilities in a manner that is sensitive to the environmental constraints in the hillside overlay district. Utilities should be installed within a 15 foot utility easement measured from back of curb or back of sidewalk (right-of-way). Water and Sewer service should be located under the street. No utilities or easements should be allowed on the rear of lots.

- **Community Pattern:**

The revised Unified Development Code contains guidelines that encourage the following specific design parameters that help create a development pattern that responds better to hillside development.

- Encourage streets to be parallel to the slope.
- Lot depth should be oriented to the slope and not the street.

- Homes should be designed so that the structure retains or takes up slope.
- Discourage "pad grading" and minimize site grading.
- Reduced front building setbacks encourage structures to locate near the street.
- Visual screening through the use of tree preservation.

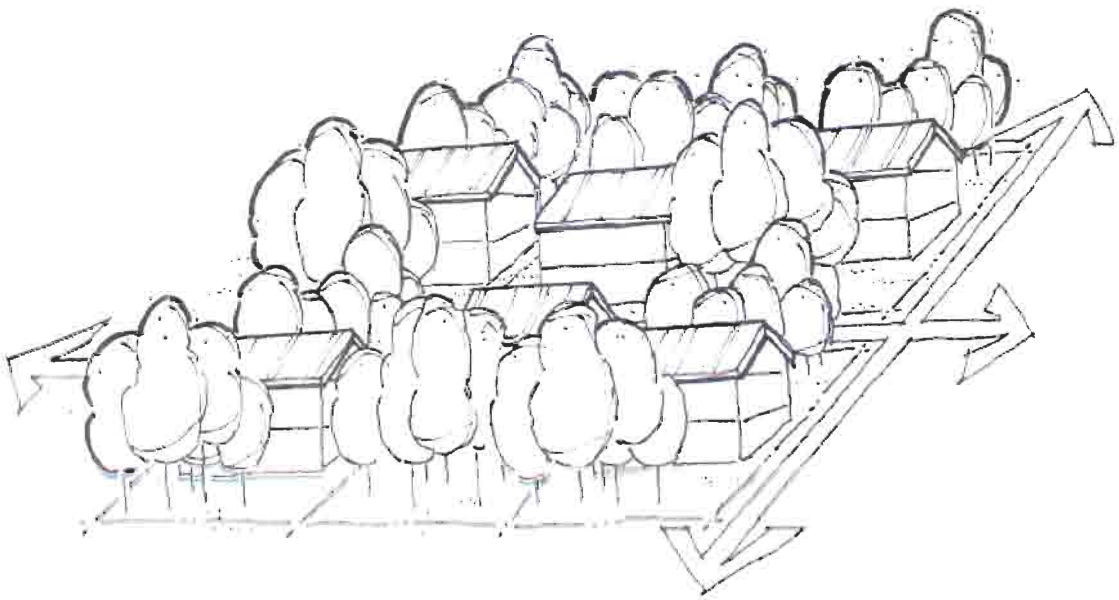


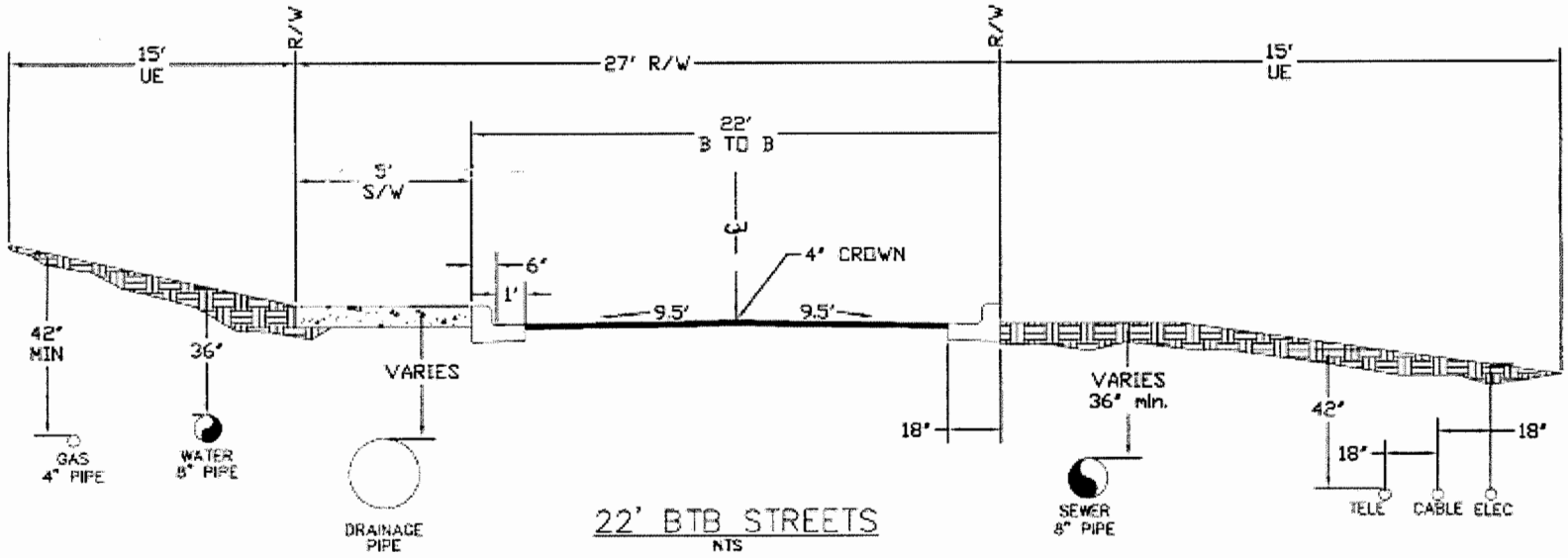
Diagram Illustrating Community Pattern *{City of Fayetteville 2005}*

• Hillside Street Cross – Sections:

The City has adopted two street cross-sections for use within the Hillside Overlay District. These cross-sections are the result of numerous meetings between Planning and Engineering Staff, Developers, and Utility Companies. These cross sections have been developed in an effort to minimize hillside disturbance while meeting the requirements for utility separation and convenience for future utility service and repair.

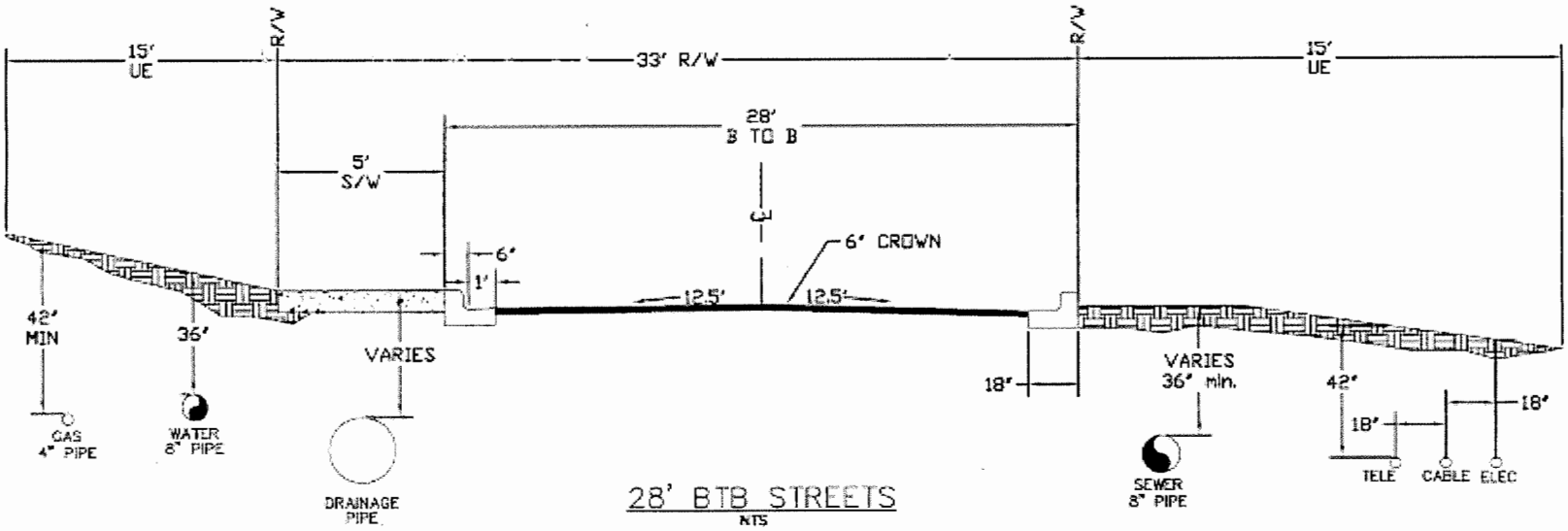
A variety of appropriate street cross sections should be allowed within the Hillside Overlay District with approval of the Planning Commission. Developers and engineers are encouraged to design street cross sections that should minimize land disturbance while providing adequate vehicular access.

Local streets in the Hillside Overlay District (HOD) may use the following street cross-section. Designed to carry limited traffic through the neighborhood, these local streets have 9.5 foot travel lanes with an overall back of curb to back of curb dimension of 22 feet. The addition of a 5 foot sidewalk adjacent to the street produces an overall right-of-way dimension of 27 feet. The narrow overall right-of-way dimension reduces the grading necessary to locate a street in the right-of-way. Utilities are located within a 15 foot utility easement located on both sides of the street. Utilities located on the upslope slide of the street are water, gas, and storm-drainage. Down-slope utilities are sewer, telephone, cable, and electricity. By locating the utilities underground and at the street, developers avoid the removal of tree canopy for utility easements located on the rear of the lots. Utilities are encouraged to locate as close to the right-of-way as possible to minimize disturbance within the utility easements.



22' BTB STREETS
NTS

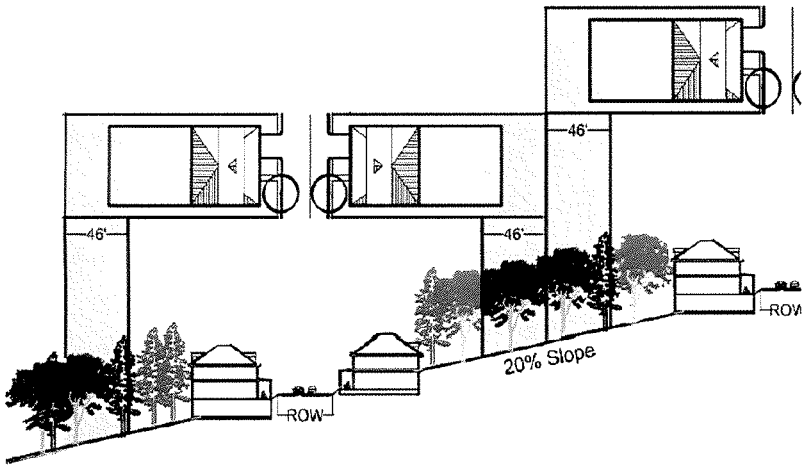
Collector streets in the Hillside Overlay District (HOD) may use the following street cross-section. Designed to collect traffic from the neighborhood and disperse it to minor arterials, collector streets in the HOD have 12.5 foot travel lanes with an overall back of curb to back of curb dimension of 28 feet. The addition of a 5 foot sidewalk adjacent to the street, required by the Americans with Disabilities Act, produces an overall right-of-way dimension of 33 feet. The narrow overall right-of-way dimension reduces the grading necessary to locate a street in the right-of-way. Utilities are located within a 15 foot utility easement located on both sides of the street. Utilities located on the upslope slide of the street are water, gas, and storm-drainage. Down-slope utilities are sewer, telephone, cable, and electricity. By locating the utilities underground and at the street, developers avoid the removal of tree canopy for utility easements located on the rear of the lots. Utilities are encouraged to locate as close to the right-of-way as possible to minimize disturbance within the utility easements.



- **Tree Preservation – Subdivision Development:**

It is the intent of the revised guidelines to preserve tree canopy on hillsides and ridgelines. The purpose of the tree preservation guidelines is for new development to accomplish the following:

- Encourage tree preservation areas on the rear of lots so that they will screen the home-site from the valley view-shed.



- Locate tree preservation in areas on ridgelines to preserve ridge profiles and screen hilltop development.

Ridgeline Tree Canopy

- Distribute tree preservation and undisturbed area throughout the entire community not just in un-developable or unseen areas.

- Allow selective thinning to enhance view potential.

Downtown Fayetteville from the scenic overlook on Mt. Sequoyah.

Summary of Tree Preservation Recommendations for Subdivision Development:

All new construction and development in the Hillside Overlay District, including single and two family residences, should comply with the Tree Preservation Ordinance which requires site analysis plan, analysis report, and tree preservation plan with the preliminary plat or site plan. Single and two family residential structures should submit a tree preservation and site plan at the time of obtaining a building permit. There should be no land disturbance, grading, or tree removal until a tree preservation plan has been submitted and approved, and the tree protection measures at the site are inspected and approved.

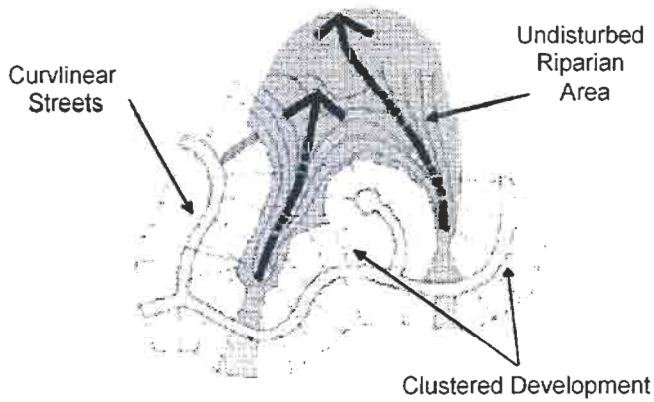
- Only the existing tree canopy area within the Hillside Overlay District is subject to the Tree Preservation Ordinance.
- During subdivision platting (lot development) the developer must leave a minimum of 60% of the subdivision area undisturbed. A total of 40% of the subdivision area may be disturbed for road construction and utility placement.
- An official City map clearly delineates the Hillside Overlay District.

Root Mtn. viewed from I – 540 looking north.

- **Cluster Development:**

Cluster development is an option that allows flexibility in lot size with development located in areas with the least amount of slope. A developer in the Hillside Overlay District may request through the PZD process a cluster development project. Cluster development patterns should be utilized to:

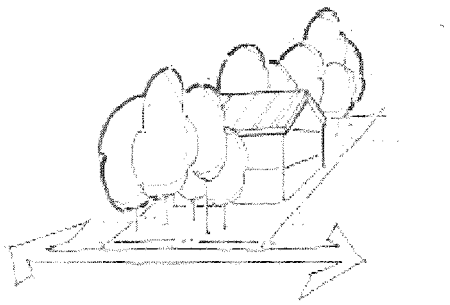
- Developers who request development rights vested through the Planned Zoning District ordinance are encouraged to use the Hillside Best Management Practices Manual in order to guide their development.
- Encourage development to occur in areas and on lands with less slope.
- Encourage more open space and tree preservation.
- Facilitate the transfer of the tree preservation requirements for single lots to a larger contiguous open space adjacent to the development.
- Minimize the view of development from the valley below with the preservation of tree cover within the public open spaces.



- **Lot Frontage and Orientation:**

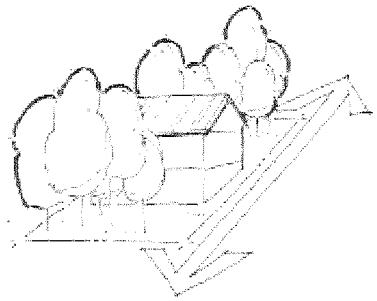
In order to accommodate hillside development and still retain the existing zoning and density, the zoning code will be amended in regards to lot width requirements. The study of the existing zoning code concluded the following:

- Allow width and depth to respond better to existing grade to enhance tree preservation and create less site disturbance by slightly reducing the lot width requirement and increasing the lot depth.



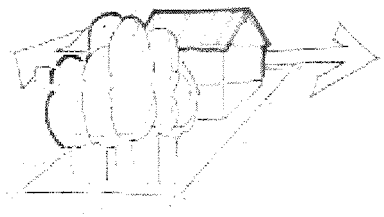
Narrowed Frontage Increased Depth

- Allow deeper side of lots to run perpendicular to grade regardless of street orientation.



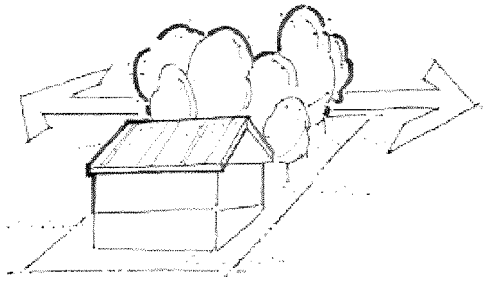
Lot Orientation with the Grade

- Encourage developers and builders to retain the tree canopy on the downhill side of the lot.



Tree Canopy Preservation on the Downhill Side

- With approval, allow flexibility in lot width and tree preservation to facilitate creative hillside development.



Flexibility in Lot Design with Approval

B. Lot Development

- **Site Planning:**

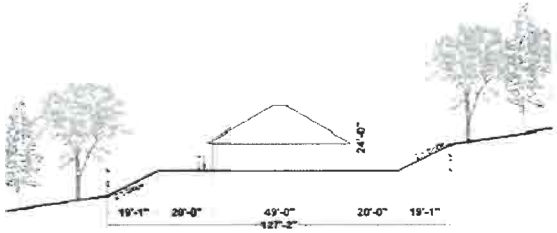
Due to the unique constraints of constructing homes on hillsides, a great deal of site planning should be conducted prior to construction. Ultimately, it is the goal of this overlay district to minimize the amount of disturbance on hillsides; property owners should be encouraged to choose appropriate architecture and home plans that will complement and work in

conjunction with the slope. Home plans purchased in a pattern book are typically designed without regard to slope and therefore their use should be minimized and discouraged. In general, this *Hillside Best Management Practices Manual* encourages the following recommendations with regard to home site planning:

- Encourage streets to be located parallel to the slope.
- Lot depth should be oriented perpendicular to the slope and not the street.
- Homes should be designed so that they take up the grade with the foundation (walk-out basements and stem-walls)
- Pad grading should be discouraged by implementing height limitations measured from the historic grade.
- Front Setbacks will be reduced to allow structures to locate closer to the street.
- Visual screening should be encouraged with the use of tree preservation on the rear of the lot.

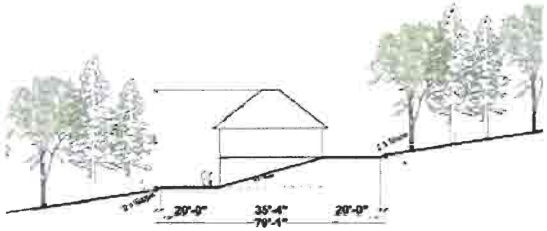
- **Home Placement and Building Setbacks:**

It is encouraged when grading a home site that the structure of the home be used to retain grade by having multiple stories or a "walk-out" lower floor. The following example illustrates the 127 feet of disturbance necessary to locate a 2,400 sq. ft. single story home on a graded pad.



127 feet of Disturbance

By simply taking up the grade with an excavated foundation and walk-out first floor the amount of disturbance is reduced to 79 feet in the following illustration.



79 feet of Disturbance

Down-slope Home Placement:

Fayetteville has numerous examples of residential hillside development that uses appropriate construction methods to take up grade or minimize the impact of residences on the down-slope side of the street.

Home placed on piers or stilts in order to minimize disturbance associated with pad development.

Home with a walk-out basement set into the slope.

Fayetteville also has many examples of downslope homes placed close to the street in order to minimize the amount of grading needed for home placement.

Homes placed close to the ROW on the downhill slope.

Home set-back minimally, with on street parking.

There is a rich complexity of architectural styles evident in the existing Mt. Sequoyah neighborhoods.

Modern home with glass front and a pedestrian bridge access to the street.

This home is slipped into the grade with a side driveway below street elevation.

The preservation of tree canopy is evident in the existing Mt. Sequoyah neighborhoods.

This home is accessed by the bridge at street level. Tree canopy preservation is abundant.

Upslope Home Placement:

Fayetteville has numerous examples of upslope hillside development that uses appropriate construction methods to take up grade or minimize the impact of residences on the slope. Homes located on the upslope side of the street can take up grade by excavating the foundation into the hillside, or by setting the home on a plinth. The following are Fayetteville examples of appropriate upslope home site design and placement.

This home is sited on a plinth. The rock retaining wall here in front takes up about 6 feet of grade at the street.

The tie-back slope shown here is attractively landscaped at the sidewalk.

Existing hillside development in Fayetteville addresses residence parking in many sensitive ways. Both, upslope and down-slope homes often locate the garage in the basement or the lowest level of the home. Detached garages and on-street parking are also commonly used as a functional means to accommodate vehicles.

The side accessed basement garage takes up grade and hides the car storage downstairs.

Both of these photos illustrate the functionality of placing the garage in the basement or foundation of the home.

This home has a side accessed garage barely visible from the street.

Parking on-street and staggered.

Parking adjacent to the street.

Detached garages are commonly used in the historic areas of the city. Utilizing a detached garage allows the home owner to place it in a location that minimizes site disturbance. Located adjacent to the street they can be "cut" into the hillside. The following photos illustrate the flexibility in the placement and design of detached garages.

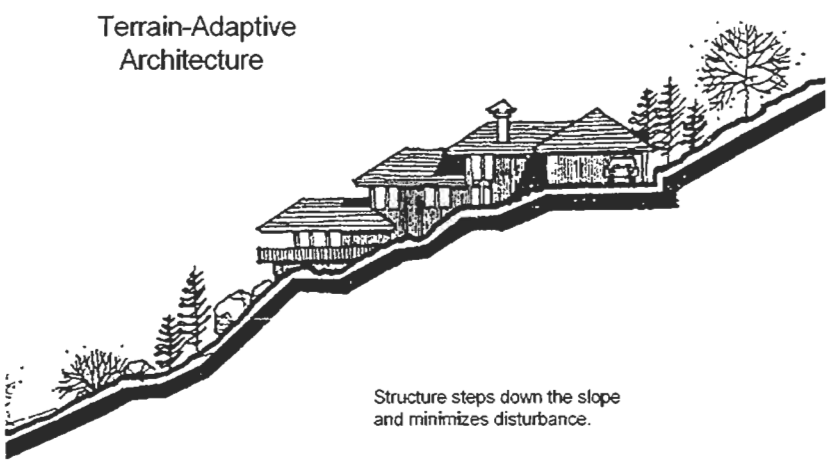
Garage cut into the slope at the street grade.

The functionality of a detached garage lends itself to creating interesting outdoor spaces. Hardscape elements, such as paths, steps, and natural stone retaining walls, along with plant materials, can link the outbuildings to the main structure.

Detached garage adjacent to the street on the down-slope side.

This detached garage has a functional second story space.

Terrain – Adaptive Architecture: By building with the slope the tree canopy is preserved and site disturbance is minimized. The following diagram illustrates this point, and the picture to the right demonstrates an example here in Fayetteville.

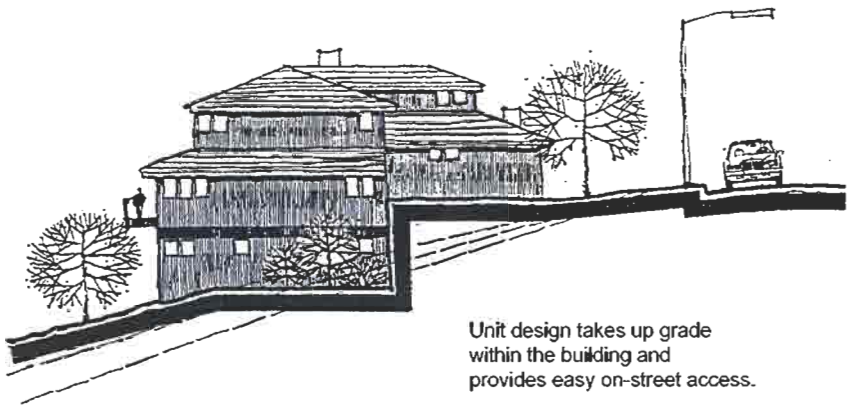


Brandes and Luzier. Developing Difficult Sites. Solutions for Developers and Builders. 1991

This home steps down the slope and utilizes a detached carport that minimizes disturbance.

Home placement on the down-slope side of the street can be achieved with minimal site disturbance by taking up the grade with the structure. Reduced front building setbacks also reduce disturbance by permitting the home to be placed close to the street.

Coss Section of a
Downhill Home



Brandes and Luzier. Developing Difficult Sites. Solutions for Developers and Builders. 1991

An up-slope example of a home that takes up grade in the foundation of the structure.

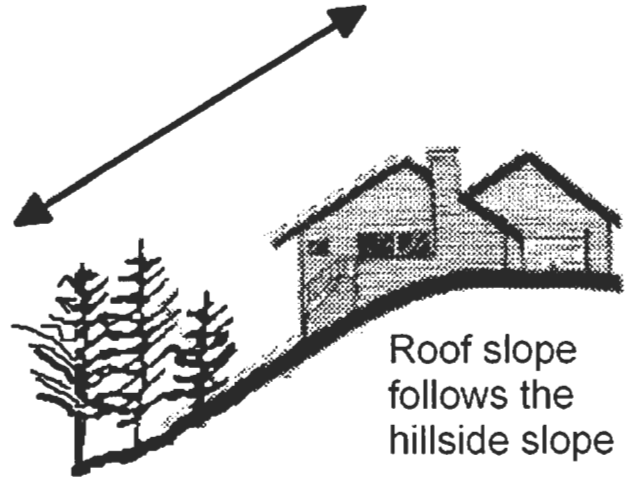
Home placement on the upslope side of the street can achieve minimal disturbance by excavating the lowest floor of the dwelling into the slope. The reduction in the front building setback allows the home to be sited close to the street with the tree canopy preserved upslope.

Cross Section of an Uphill Home Cut into the Slope

Brandes and Luzier. Developing Difficult Sites: Solutions for Developers and Builders. 1991

This home takes up the grade in the foundation by cutting into the slope. Note the side loaded garages located under the second story of this home.

With terrain adaptive architecture located on both the upslope and down slope sides of the street a uniform street pattern can then develop as shown in the example below.



Home site placement should also take into consideration the orientation of the slope of the roof of the home. Generally, the slope of the roof should go with the direction of the hillside slope. This minimizes the visibility of the structure from below, and with natural colored roofing materials it can help the structure actually blend into the hillside.

- **Building Setbacks:**

An integral element of the Hillside Overlay District regulations is the reduction in the front building setback dimension. Land located within the Hillside Overlay District should have a minimum front building setback of 15 feet which will also be used as a utility easement. The reduced front setback will allow, and hopefully encourage, builders and lot owners to locate structures close to the street. Side setbacks will be reduced to 5 feet. Ultimately, this will reduce the amount of disturbance on a lot.

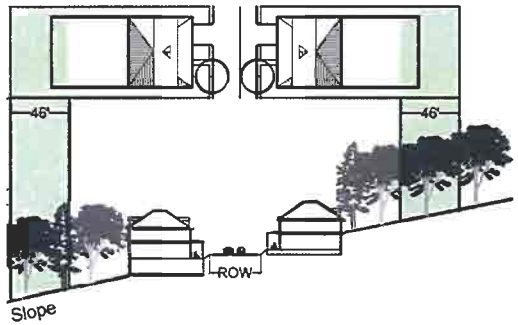
The front porch of this home is setback 8 feet from the back of the curb.

This home is setback approximately 15 feet from the back of curb.

- **Tree Preservation:**

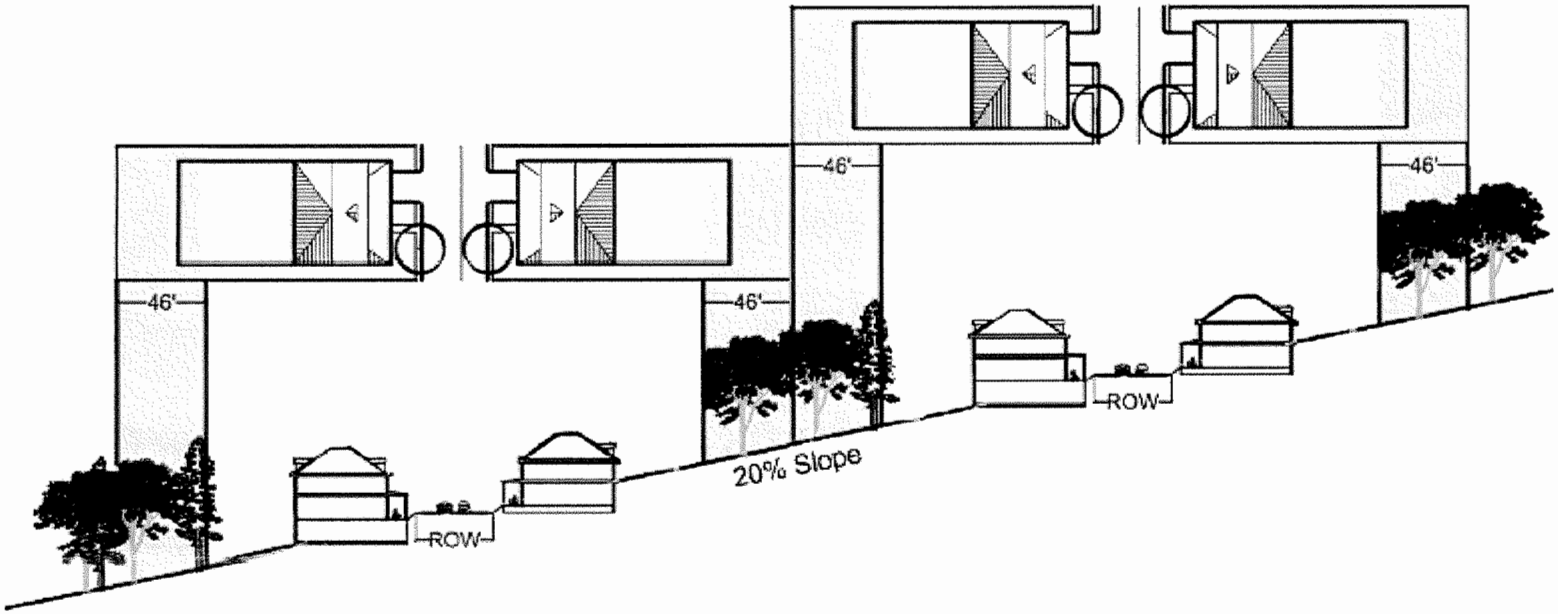
All land located within the Hillside Overlay District is required to meet the provisions of the Tree Preservation Ordinance regardless of lot size. At the time of development, a tree preservation plan must be submitted and meet the approval of the Landscape Administrator. Lots in the Hillside Overlay District should be required to preserve a minimum of 30% of the existing tree canopy. The preservation of trees at the rear of lots is optimal, and should be encouraged on the lot, because it will screen the development from the valley below. The reduction in the lot width requirement allows the developer to plat lots with increased depth. These longer and skinnier lots, along with street located utilities, enable lot owners and builders to preserve tree canopy in the rear of the lot.

For example, a 10,000 sq. ft. lot can have a street width of 60 feet and a depth of 166 feet. If the lot consisted of 100% tree canopy, the lot owner could meet the 30% tree canopy preservation by leaving the 46' at the rear of the lot undisturbed.

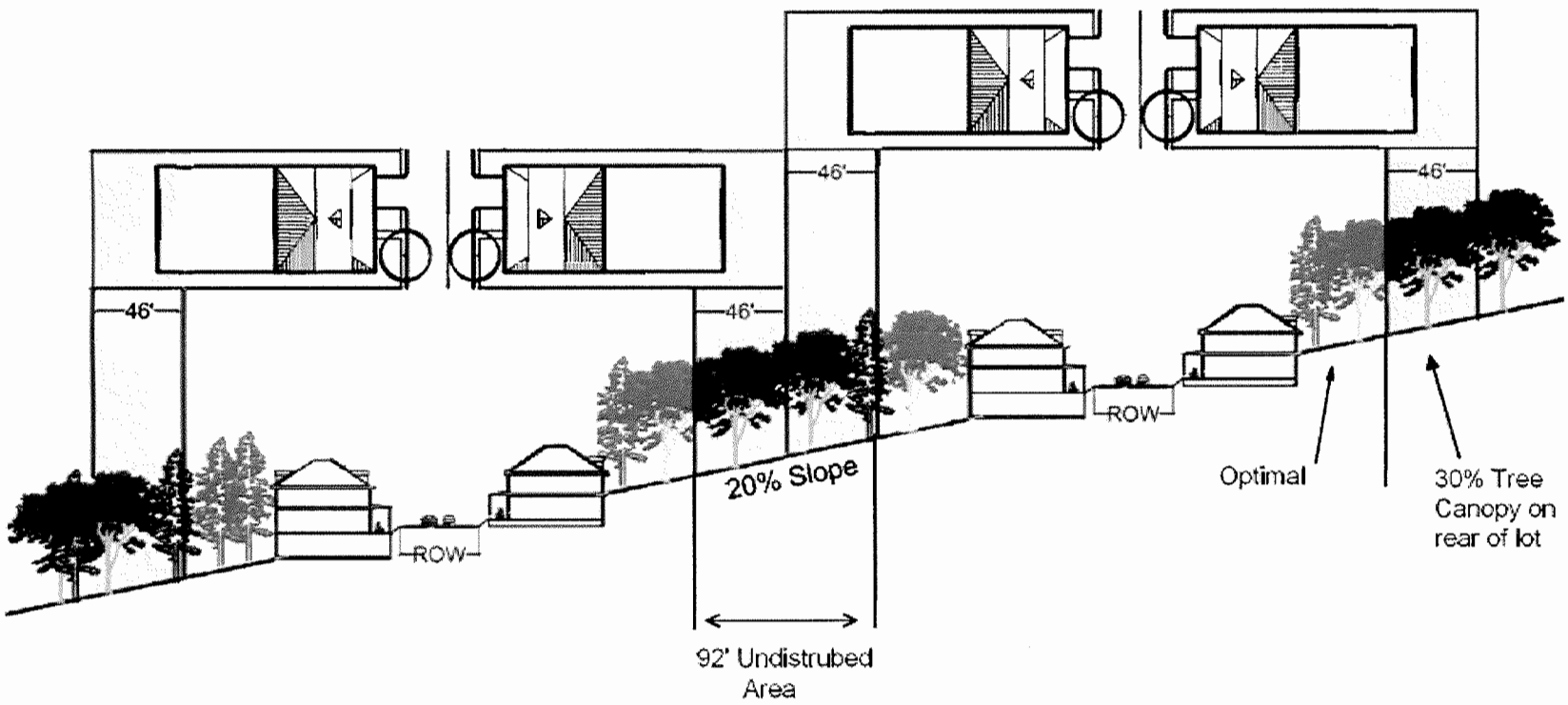


The Tree Preservation Area is shown above highlighted in green (46').

With the streets located parallel to the slope the tree canopy that is preserved will screen the homes as viewed from below. The buildable area of the lot is not affected due to the reduction in the front building setback line. Ultimately, the overall development pattern should look something like this:



When tree preservation is accomplished in the building zone, lot owners and builders can preserve a substantially larger portion of the overall tree canopy on the hillside as illustrated below. The area highlighted in green (46') is the minimum required tree canopy preservation (30% of the lot), and the slightly faded trees are additional canopy that is preserved due to careful site design. The final build-out in the following example illustrates a minimum of 92 feet of undisturbed tree canopy located on the rear of these lots.



- **Measuring Building Height:**

Measuring building height on hillside has always been left to interpretation. As a best practice to discourage pad development, buildings should be measured from the lowest point of the structure, prior to development, at the historic grade to the highest point of the structure. Building height should follow the following guidelines:

- A maximum building height of 60 feet is allowed for single-family and two-family structures.
- A maximum building height of 60 feet for 3+ story multi-family development.
- Homes set into the grade can achieve 4 stories on the down-slope side of the street and 3 stories on the upslope side due to the lot not being padded.
- If padded, then the height of the building is reduced and measured from the historic (pre-development) grade with a maximum of two stories.

The following illustration shows how building heights will be measured in the Hillside Overlay District.

Building height should be measured from the lowest point of the structure at the historic grade, prior to development, to the highest point of the structure. If the structure is located on a graded pad then the height of the building is measured from the historic grade.

- **Parking:**

Parking for residents living in hillside developments creates challenges that are not encountered with flat land development. Steeply sloped lots can make traditional front-end loaded garages impractical. Historically, developed areas of Fayetteville utilized practical methods for the parking of vehicles.

- **On-Street Parking:**

In many residential areas of the City, on-street parking is used as the primary parking for residents. Homes that are built on traditionally sized lots (50' wide) have little room to run a driveway to one side of the dwelling. Parking for down-slope homes is usually on or adjacent to the street. Parking areas parallel and adjacent to the street are used effectively on narrow streets to remove the parked vehicle from the traffic lane.

Historic home in located at a triangular intersection in Eureka Springs. Note the on-street parking.

Parking adjacent to the curb on the down-slope side of the street.

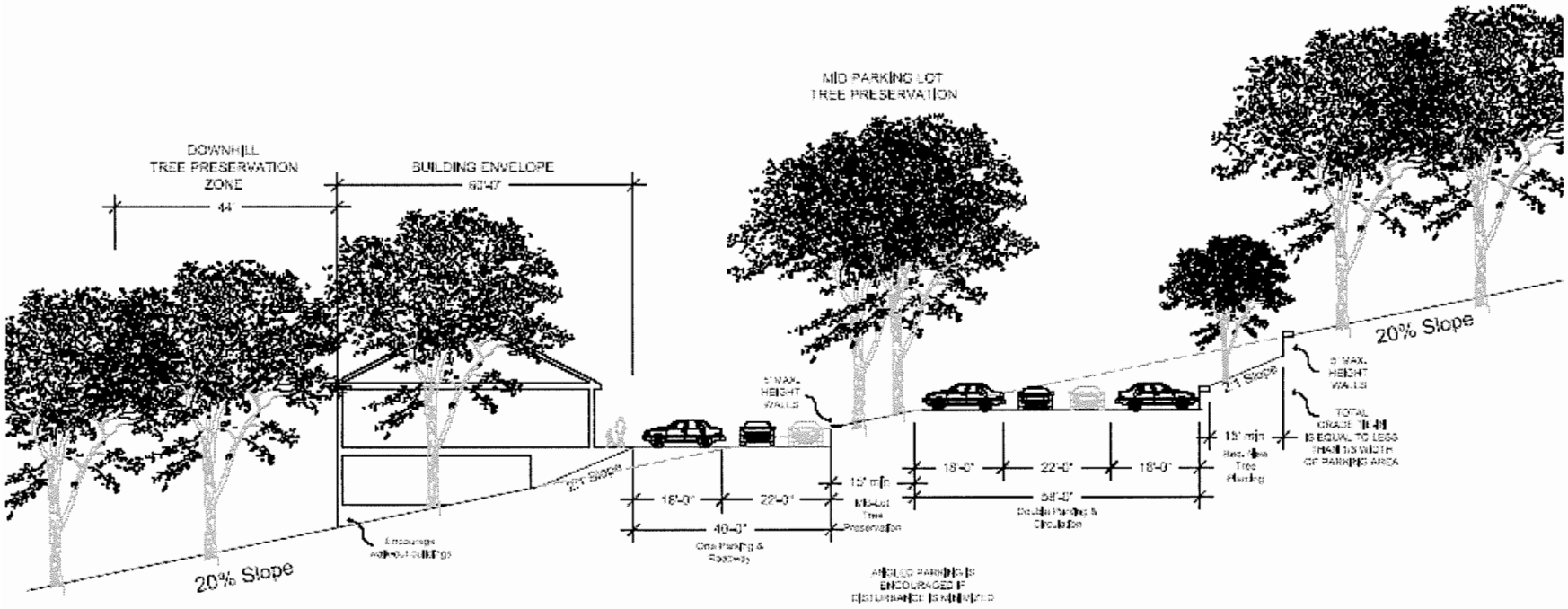
- **Off-Street Parking:**

Off-street parking can be accommodated with an 18 foot setback from the street or sidewalk for head-in parking. Tucked-under garages are an efficient parking solution for both up-slope and down-slope homes. Finally, detached garages allow for interesting lot and landscape layouts.

- **Multi-Family Residential Parking:**

Parking for multi-family residential units are encouraged to be located in the lowest floor of the structure in order to reduce tree canopy removal for surface parking areas. Surface parking should be encouraged to step down the hillside with 60' wide parking areas running parallel to the slope, grade transition areas, and undisturbed tree canopy preservation areas located in between parking pads.

The cross section provided on the next page should be used as a guide for developers of Multi-family Residential and Commercial properties.



Cross section illustrating multi-family and commercial parking lot, street, and structure layout to minimize disturbance and tree canopy removal.

- **Physical Alteration of Land – Grading Ordinance:**

  - **Grading Recommendations:**

Single-family and two-family lots within the Hillside Overlay District will be required to obtain a grading permit. All new development, regardless of size should comply with the grading ordinance. If a parcel of land is bisected by the Hillside Overlay District boundary line, only those areas that fall within the Hillside Overlay District will be required to comply.

Site plan approval is required for any development located within the Hillside Overlay District prior to any development activity.

Builders are allowed to file jointly on contiguous parcels or subdivisions as long as erosion control and protective measures are in place until project completion.

A minimum of 25% of the slope tie-backs for roads and residential lots should be re-vegetated pursuant to the landscape manual.

- **Erosion Control Methods and Green Storm-water Alternatives:**

  - **Reducing storm-water runoff during construction:**

A substantial amount of storm-water erosion occurs during the construction phase. At a minimum all new development projects in the Hillside Overlay District should follow the following guidelines:

1. Minimize exposure to denuded soil from rain water and snow melt by establishing vegetation as soon as possible.

2. Sediment collection devices such as basins, inlet filters, and perimeter silt fences should be used to minimize soil erosion.

3. The retention of vegetative buffers adjacent to environmentally sensitive areas or stream corridors is encouraged.

4. Equipment and hazardous materials should be stored correctly to prevent contamination from leakages.

Silt fence at a construction site in Fayetteville.

  - **Reducing Storm-Water Runoff after Construction:**

Site planning considerations prior to development can greatly reduce the

amount of storm-water problems post-development. The following guidelines encourage storm-water best practices:

1. Reduce impervious surfaces that prevent rain water from soaking into the ground.

2. Retain the natural landscape in order to soak up, store, and evaporate storm water.

3. Detain and infiltrate storm water to allow it to soak into the ground or release more slowly into the storm water systems.

4. Remove the pollutants before they have a chance to enter the storm water system.

Storm water detention basin in Fayetteville.

- **Green Storm Water Alternatives:**

Green storm water alternatives are designed to utilize best management practices that **avoid**:

1. Increasing runoff volume and speed which may lead to flooding and erosion.

2. Decreasing the ability of water to recharge into the ground.

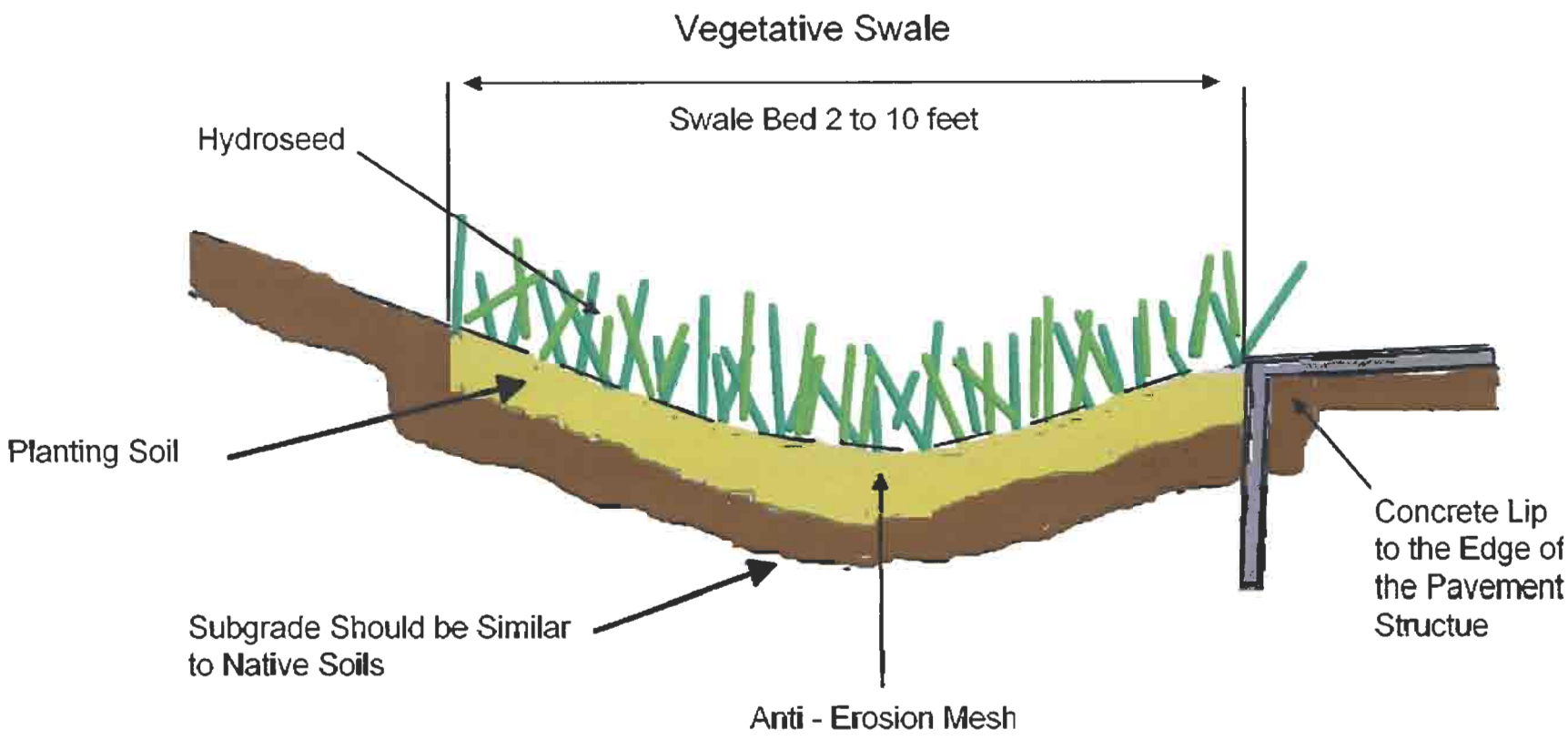
3. Increasing storm water runoff temperatures through the overuse of impervious surfaces.

4. Increasing the amounts of pollutants from motor oil, fertilizers and pesticides, and sediments entering natural water systems.

This split driveway with a grass median reduces the amount of impervious pavement surface.

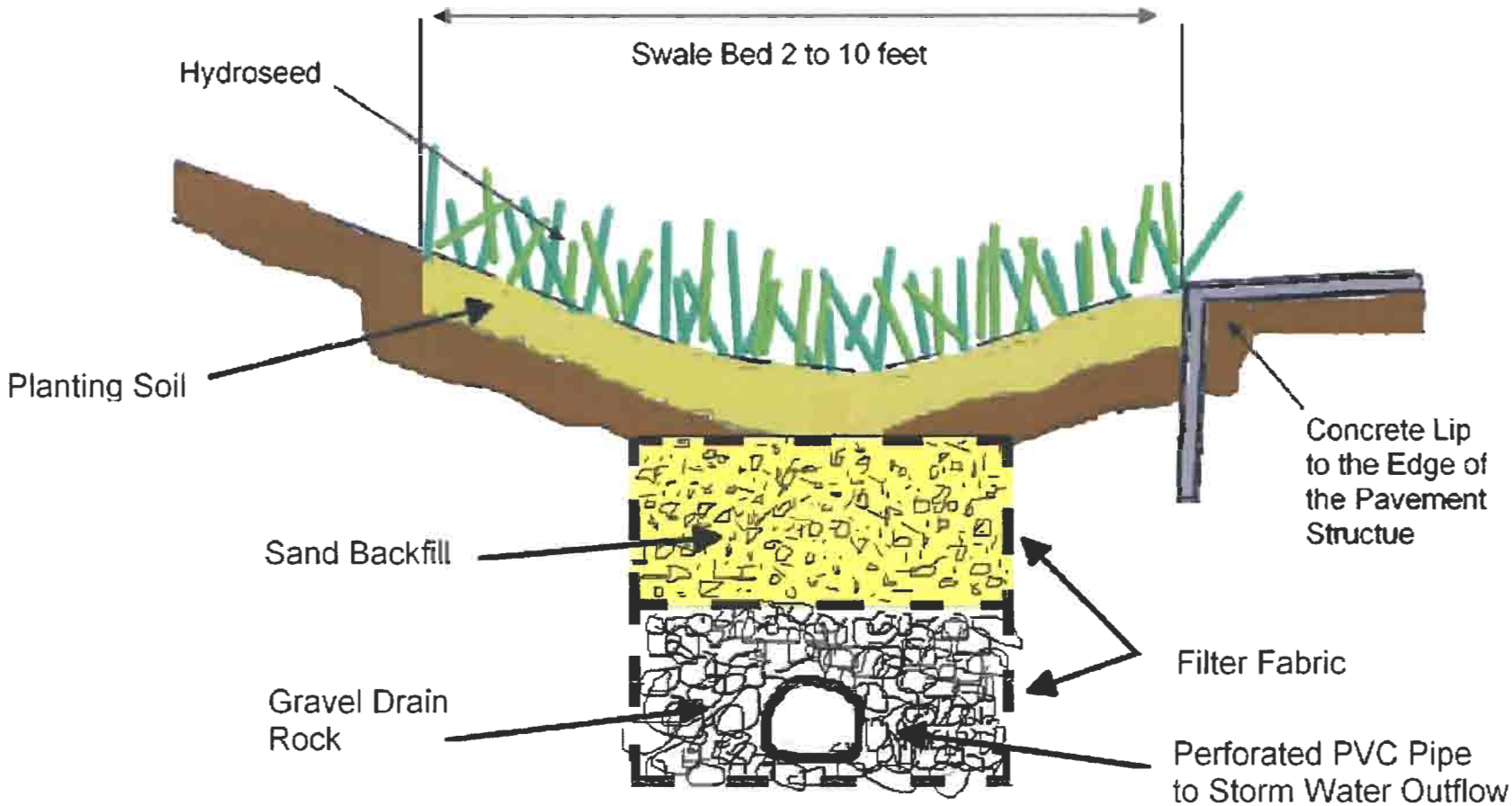
The following site design options provide alternatives to conventional storm water practices. Best management practices that detain, retain, and filter runoff before it enters the natural water system are the following:

1. Direct rooftop runoff to bio-retention areas, vegetative swales, soakage trenches, dry wells, and French drains for dispersal.



Vegetative swale with eventual ground infiltration of storm water.

Vegetative Swale with Filtration and Outflow



Vegetative swale with a sand filtration layer to designed to capture pollutants from storm water before being drained off-site.

Bio-swale located in Seattle Washington.

Bio-swales are an effective storm water best management tool for areas in the Hillside Overlay District with minimal slope, usually near the toe of the slope or in riparian areas. The use of plant material is highly effective in reducing the amount of pollutants eventually entering the stream and river systems. Careful site considerations include: slope, soil mitigation, and appropriate vegetative materials.

2. Encourage the use of rain barrels or cisterns for the collection of storm water for later irrigation purposes.

Rain barrel used to capture storm water for irrigation purposes.

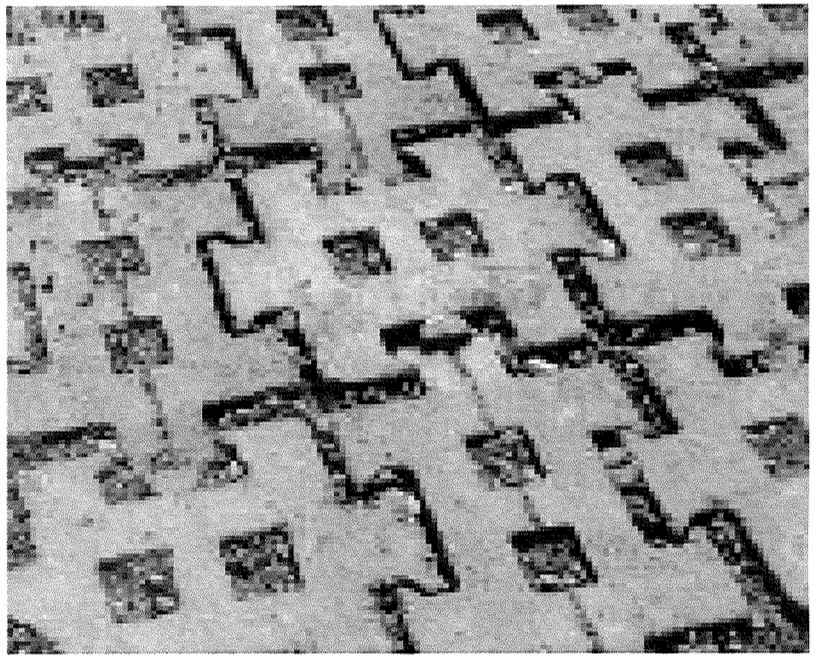
3. Utilize subsurface infiltration practices such as sand filters and vegetated infiltration basins to retain and filter storm water runoff.

4. Provide storm water treatment in parking lots by using bio-retention areas and filter strips or bio-swales.

5. Encourage the use of pervious pavers for driveways and patios.

An example of pervious pavers used in a sidewalk application.

Pervious pavers are especially effective in moderate vehicular traffic areas such as driveways and parking areas. Their use is highly recommended for home site design. They can be used to attractively construct patios, sidewalks, and driveways.



Interlocking pervious pavers with sand joints..

If surface parking for multi-family residential development are proposed in the Hillside Overlay District, it is strongly recommended that a Hybrid Parking Lot design is utilized in order to maximize storm water filtration. A Hybrid Parking Lot is constructed with hard surface, concrete or asphalt travel lanes, and pervious parking stalls. Used in conjunction with a bio-swale to collect run-off, they are highly effective in filtering and absorbing storm water.

An example of a "Hybrid Parking Lot".

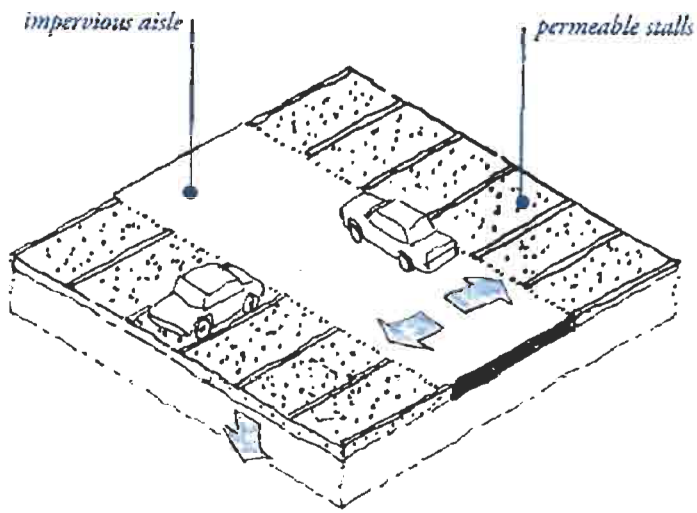


Diagram of a "Hybrid Parking Lot".

5. Bibliography of Sources and Resources

This *Hillside Best Management Practices Manual* was compiled with materials gathered from various sources and individuals. The following sources contributed to this manual:

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H2 Engineering. Street Cross-Sections. Fayetteville, Arkansas