



**An Ecological and Physical Investigation of Pittsburgh Hillside
REPORT to the City of Pittsburgh Hillside Committee**

Final Report
November 30, 2004

Prepared in cooperation with Allegheny Land Trust for the City of Pittsburgh Hillside Committee
Funded by The Heinz Endowments

Prepared by:
Stephen Farber, PhD
3 Rivers 2nd Nature
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Executive Summaries

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PREFACE TO EXECUTIVE SUMMARIES

This investigation of the ecological and physical environments of Pittsburgh's hillsides, with economic and legal support, is intended to assist the City of Pittsburgh Hillsides Committee with its deliberations and recommendations regarding the future of Pittsburgh's hillsides. While a number of opinions have been voiced about the regulation of hillside preservation, conservation or development, there has been little research on the character or function of the hillsides. One of the goals of this project has been to provide an informed framework for establishing coherent public policy.

The REPORT to the City of Pittsburgh Hillsides Committee is a compilation of four individual reports that together form that framework:

- Economic Report
- Ecological Report
- Physical Report
- Legal Report

Creating an appropriate policy toward hillsides involves an understanding of their many contributions to the viability of the city-functional, economic, form-giving, aesthetic, and social-as well as the liabilities they may impose on development-hazards and costs. This is a multi-disciplined challenge. The investigation brings together expertise in the environment, ecology, geology, urban design, and landscape architecture. Legal and economic expertise provides firm grounding to the investigation's recommendations.

All recommendations and evaluations documented in this REPORT are conceptual in nature and do not suggest engineering solutions. The REPORT is not intended to contain recommendations for specific private property or properties, and not text or illustrations should be interpreted as such.

The Executive Summaries that follow highlight the salient points and arguments of the respective reports. Please refer, though, to the full reports for additional and more detailed information.

Executive Summary
Economics of Hillside Slope Development
Stephen Farber, PhD

The economic values of hillsides and the preservation of vegetative covers on hillsides arise in several ways. First, the topographic relief provided by Pittsburgh hillsides is a major landscape defining feature that is distinctive and provides a unique identity to the Pittsburgh region. This value is manifest in the visual image of Pittsburgh projected nationally and internationally with scenes of the Golden Triangle and associated riverine/hillside landscapes. This value is inestimable as a distinctive feature, keeping the image of Pittsburgh in the public eye as a pleasant place to live and visit; an economic development value that would be difficult to quantify but is likely substantial. A second value of the unique topographic relief is its role in defining neighborhoods and communities. The hills and valleys afford a sense of place and community identity that is inestimable, yet clearly apparent from the settlement patterns and strong identities with local communities. A third value is a more estimable economic value; the economic value of the topographic and associated land cover landscape amenities. As noted below, these values are most often evidenced in enhanced property values in proximity to those amenities. Finally, a very important and estimable set of economic values of the land cover associated with the typical topographic relief in Pittsburgh is attributable to the natural system services of those ecosystems. These values are discussed below.

A considerable number of reputable economic studies illustrate the economic values of various urban environmental amenities. The most reliable of these studies estimate the enhanced property values attributable to those amenities. These studies have been undertaken in a variety of urban areas: Boulder, CO; Columbus, OH; Portland, OR; England; Baltimore, MD; Washington, DC; Fairfield, CT; Grand Rapids, MI; Los Angeles, CA. They all demonstrate that proximity to green spaces and/or open spaces enhances property values. These premiums for proximity can range up to 25% of the value of a property; but are most likely to augment property values by around 5%.

The vegetative cover typically accompanying hillsides defines ecological types that provide a variety of natural system services. Vegetative cover in watersheds reduces stream pollution, as shown by several studies. Reduced pollution has economic value in terms of increased recreational values, reductions in health related costs, and reductions in water treatment costs downstream. The ecological values of tree cover can be considerable; for example, in the management of runoff. A study of Los Angeles illustrates this: increased tree cover would reduce stormwater and flood control costs by nearly \$4 per tree. The pollution and heating/cooling values of tree cover were shown to be considerable in a Chicago study.

It would be reasonable to expect that public infrastructure (roads, sewers, water, electricity, etc.) would be considerably more costly in the case of hillside developments than development in flatter relief. Similarly, development in areas not served by this infrastructure would be more costly than in "infill" areas. For example, a study in Australia illustrates that road costs were \$2500 higher per dwelling unit in an undeveloped "Greenfield" than in an "Urban Infill" development.

Even when developers pay for the extraordinary infrastructure costs, and pass these costs on to buyers, there remain the public infrastructure maintenance costs, and public service costs (fire protection, police protection, waste collection, etc.). Impact fees are not typically assessed to cover these extraordinary recurring costs. To the extent that the full value of extraordinary costs of hillside development are not paid for, other taxpayers must end up subsidizing these developments, and the less-than-full-costs simply encourage such developments. Costs of public services for residential developments generally compare unfavorably with the tax revenues from those developments. A summary of over 90 cost of services studies in the US showed that, on average, residential developments cost roughly 15% more than the revenues that could be expected from those developments on a per dwelling unit basis (property taxes, local sales and income taxes, etc.)

In addition to extraordinary infrastructure and public service costs, hillside developments, and associated alterations of ecosystems, result in the loss of natural systems services, which may have considerable economic value, especially in landslide, flood prone, high topographic relief areas such as Pittsburgh. The public bears the costs of these lost services in the form of increased pollution of streams, increased water treatment costs, increased flood conveyance and control costs, etc. These increased costs have an equity implication when it is poorer people who live downhill or in downstream floodplains.

An Ecological and Physical Investigation of Pittsburgh's Hillside



EXECUTIVE SUMMARY - ECOLOGICAL REPORT by Timothy M. Collins

I think I can safely say that our team would be first to argue that land within the city is best used for development. Dense urban environments can create efficient transportation, education and cultural infrastructure and enormous savings in terms of energy consumption. Dense urban environments also leave ex-urban lands open to agriculture, forestry or recreational uses. However, in instances when the development of urban land may create a threat to public safety, or when citizens decide to save land for its intrinsic values we must reconsider the suitability of development. What follows in this report are tools to help clarify the zoning and regulation of undeveloped City hillside lands. Ultimately, these tools will enable the development of a long-term set of policies that provide for systematic hillside land preservation, species conservation and, when warranted and affordable, ecological restoration.

One hundred years ago, preservation and conservation movements were born as a reaction to the perceived encroachment of the industrial economy upon land. For the first time there was a sense of the physical limits of resource extraction within the United States. Preservationists believed that wilderness was in a state of grace, beyond the limits of human habitation. Nature was something to be preserved and contained for future generations. Conservationists believed that wilderness was a resource bounty to be managed and controlled for long-term economic benefits. Both of these philosophical and political positions placed nature (in the form of wilderness and land-resource) well beyond the limits of cities or towns. The post-industrial reaction to impacts upon soil, water, land, air, climate, and our bodies is ecological Restoration. "Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed." (www.ser.org) Restoration ecology is a new way of thinking. It links citizens and experts, as well as cities and outlying lands, in a broad program of ecological awareness and action. It is a community of disciplines synthesizing a continuum of diverse knowledge and practices. In many ways the challenge of restoration ecology is to promote a community of environmental health, aesthetics (after Nassauer and Muelder Eaton) can be an indicator of that healthy vitality.

Through out time there has been a struggle between practical minded people that see utilitarian value in nature and those that see intrinsic value in nature. Utilitarian value is primarily external from the object of contemplation, while intrinsic value is internal. In other words, the utilitarian value of

a tree in a forest can also be found in the value of the wood, when extracted, milled into lumber and brought to the mill workers shop where it can be cut and joined to create fine furniture. Trees in the forest provide jobs for the lumberjack that cuts the tree, the sawmill owner that processes it from tree trunk to usable lumber, the truck driver that hauls it, and the craftsman who makes wonderful objects from lumber. The tree as a raw material is a resource that supports life, enables the economy and is ultimately a renewable resource although one that regenerates slowly over time.

The intrinsic value of the tree is a more complicated question. Does a tree have a sense unto itself? Does it feel pleasure and pain? Does it act in its own self interest? Can humans act as advocates for the legal rights of tree's in much the same way that act as advocates for corporations, small babies, or other non-verbal entities? Recent philosophical literatures raises the question of agency and self interest, moral authority and advocacy are subjects of intense study and conflicting argument. Recent forays in the literature of political ecology examine the idea that nature and tree's could have rights, or that the divided houses of culture and nature could reunite in a new concept of scientifically and metaphysically informed government. Are these thoughts appropriate for a city like Pittsburgh, where the culture and economy has been constructed and sustained upon the ideology of resource use and the economies of extraction?

For our purposes we can leave behind the heady discussions of philosophy and instead discuss intrinsic value in terms of a tree's essential relationship to the land. We can also discuss the utilitarian services this tree provides to the human community during its tenure, which by the nature of the tree's self-replicating life-force can be quite substantial, The tree is part of a network of roots processing nutrients. The roots provide the structure that holds the soil from erosion. The tree has a role in the hydrologic cycle, processing water in the root zone, it draws water through the trunk and releases it from its leaves into the air in the form of gas. It has a role to play in air quality, it is a sink for carbon dioxide and a source of clean fresh air through the stomatal openings in the leaves. The structure of the tree provides shelter for wildlife, its fruits provide food, the shade cools the air. The tree when alive and part of a forest is a primary structural element of a larger ecological infrastructure that is all alive. A tree competes with other trees and plants in the forest for sunlight, Its bark reacts to nails and materials that pierce it, healing itself, not unlike our own flesh. It reacts to changes in the weather, it blooms in the spring, cloaks itself in colorful foliage each fall, and reveals its fundamental bare wood structure each winter. The tree is alive, it procreates, its value is unto itself and in relationship to the forest. Humans can share those values as members of the forest community, or impose a more utilitarian value upon the tree, and deny its life. Mans dominion over nature goes back to the Bible. Despite this history of dominion, the tree is a living entity that is part of the network of life. A living tree has a defensible role in the human economy based on the studies of the environmental economist Steve Farber, whether it has intrinsic value that can be imposed on others, is the meta-topic (but not the focus) of this study. The primary topic is utilitarian, steep wooded hillsides are green-infrastructure that bring significant services to human communities. Green infrastructure mitigates landslides, storm water impacts and air quality issues. Following the bias of Pennsylvania's courts, we will confine what by now should be a clearly perceived empathetic interest (on the part of this author) in the life of nature, to its subservient role in the support of public safety and as a "reasonable" alternative to land use development, on the basis of green-infrastructure values.

Tools to inform the discussion of City hillside zoning.

Our sense of the “nature, or ecology of this place” is colonized by the language of cultural spaces, and architectural design. This is a highly abstract ideology of enclosure, of private parcel ownership and municipal authority. Municipal zoning seeks to minimize the negative impact of private development. It is at its strongest when focused upon the protection of public health, safety, morals or the general welfare of the greater community. Despite a history of urban landscape theory that has roots in ancient city design, modern authority in the writings of Ian McHarg and contemporary validity in the discourse of landscape ecology, political ecology and restoration ecology - the issues of ecosystem services are primarily undermined or enabled by parcel by parcel regulation and decision making. We assembled a team of artists, natural scientists, an environmental planner, an urban designer and various computer mapping experts to develop tools that might enable natural systems in the city. The first question we struggled with was what component of the natural world could we target, that might -- provide the relevant argument that would allow the Hillside Committee of the City of Pittsburgh to feel confident that a new hillside zoning regulation was equitable to landowners as well as legal and enforceable? The second question we struggled with was what issues could we identify that would enable the most robust democratic discourse within each neighborhood, about the value of open space, and the struggle over the meaning of the public realm, the public will, and larger social and environmental ideals in relationship to the rights and aspirations of individual property owners?

After much consideration, we decided to provide analysis of both quantitative and empirical data that can inform rational decision making on steep slope properties at the level of zoning policy, regulation and enforcement. The focus in this section is upon 25% slopes or steeper, this is an angle at which many soils become unfit for urban development, creating both on site and downslope threats to public safety. This is also a slope angle where the buildings in the city drop off significantly, and city services in terms of roads and sewers are inconsistent and often nonexistent. In turn, this also means that these are the places in the city where remnant forests have flourished, or where natural recovery has occurred to significant effect, in some cases creating interconnected forest patch-corridor matrices that result in emerald arcs, forests that are visually stunning and increasingly valuable to humans that value proximity to nature and the green-infrastructure services of nature, even at the urban core.

All materials in the Ecological Report have been developed with the express intention of reflecting the analysis and outcomes of Cyril Fox’ study of the authority and jurisprudence of land-use controls. Following the Fox report, we were seeking an analytical methodology that would “identify potential danger from landslide and other development problems” as well as examine the cities current stock of “adequate public services and infrastructure” at each of these parcels. Finally we were seeking to minimize any “perception of arbitrary decision making” – through the rigorous application of accepted material data sets supported by the City of Pittsburgh, Allegheny County and the United States Agricultural Service. In the high ideals and ancient history of rational planning, we have decided that the best way to act in the interest of the public realm, was to let the data speak for itself.

Specific goals:

Tools for Democratic Discourse

- Contextual analysis at the watershed scale.
- Open space needs analysis at the neighborhood scale, and

Decision Tools

- Decisions analysis at the parcel scale.
- Field studies to inform land use guidelines.

Tools for Democratic Discourse.

- Contextual analysis at the watershed scale.

The ecological report focuses first on the watershed scale - maps that help us understand the urban relationship to topography, hydrology, woodlands, parks and interior forest. This is nothing more than a conceptual framework to help us understand the function and failure of natural ecosystems within the city. The final map in this series (map 1.7) gives us a sense of the significant forested areas of the city, and their relative interior forest, defined as the forest area approximately 100 meters from the edge of forest patch (Moyer 2003). Interior forest habitat is critical to maintaining populations of organisms which require stable sources of food and cover.

- Open space needs analysis at the neighborhood scale.

Secondly we looked at the city on the scale of neighborhoods. On a neighborhood by neighborhood basis, we mapped resident income, average value, population density and vacant parcels in relationship to parks and open space. In this section we argue that neighborhoods with low per capita income, low value, and high population density have a greater need for open spaces than those places with high income, high value and low population density. These maps provide the reader with a means to understand what neighborhoods have access to open space, to parks and forests and which do not. Arguably this can be used by citizens and officials alike to think about what these steep hillsides mean in terms of the social and ecological characteristics of each neighborhood, and where there are issues of equity and access or lack there of.

Decision Tools

- Decisions analysis at the parcel scale.

We were seeking to develop a decision matrix, that would allow each parcel in the city to be analyzed and then sorted into areas for preservation, conservation or development. We were seeking an analytical methodology that would allow us to identify potential danger from landslide as well as available public infrastructure that could service each parcel. Our method is based upon the best available knowledge of soils (in terms of erosion, foundation and roadbed safety) in the city. And upon each parcels relationship to adjacent buildings, or proximate (within 100-300 feet) roads and sewers. This is the most objective, rational manner that we could come up with to sort parcels into scientifically informed and legally defensible zoning categories. The data for this analysis is from the United States Agricultural Department Study of the Soils of Allegheny County, and existing City of Pittsburgh infrastructure studies. Based on this data and analysis we were able to arrive at the following standardized definitions.

Preservation: land deemed environmentally unfit for development due to erosive soils, and a lack of available City infrastructure.

Conservation: land with sensitive but not exclusionary soil characteristics for safe building practices, with some infrastructure necessary to support development.

Development: land with both the soil characteristics for safe building practices and available infrastructure to support development.

With the clear understanding that this exercise is intended to inform Pittsburgh City Zoning, we realized that the geo-referenced data sets would need to be effectively queried at the level of individual City parcels. We were able to develop a Microsoft Access database tool we call the “parcel identifier.” This tool allows the casual user, or City planner to query the infrastructure and soils databases for each City parcel using the lot and block numbers. The results of that query are recommendations for preservation, conservation or development described above. Finally we added two “push” categories that inform the user of potential threats to development due to the proximity of the underlying coal seam, or potential benefits to preservation and conservation ideals in terms of adjacent woodlands.

The relative effects of the “parcel -identifier” database are mapped and charted for the total number of parcels on slopes >25% in the outline below. This data set provides the committee with an understanding of the affects of the analysis on the total number of developable parcels. All four categories include the infrastructure and soil safety information. The ecology team would argue that the soils and infrastructure decision should remain unchanged, however there is room for discussion and decision on the “push” factors.

Parcels Without Woodlands or Coal

This is the cleanest and simplest presentation of the relationship between existing infrastructure and soil conditions as analyzed by the “parcel identifier.” Using just soils and infrastructure we have a very simple, clear and concise tool to inform decisions on zoning.

Preservation	3494 parcels (30%)
Conservation	3951 parcels (34%)
Development	4310 parcels (36%)

Parcels with Coal Only

If we were to only include the coal seam underlay as an additional -public safety- push factor, the categories increase or decrease by the following number of parcels/percentage:

Preservation	3806 parcels (33%)
Conservation	3937 parcels (33%)
Development	4012 parcels (34%)

Parcels with Woodlands Only

If we were to consider the parcel - woodlands condition as an additional -ecological systems- push factor the categories increase or decrease by the following number of parcels/percentage:

Preservation	5782 parcels (49%)
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Conservation 2897 parcels (25%)
 Development 3076 parcels (26%)

Parcels with Woodlands and Coal

With the addition of both the woodland and coal “push” categories the categories either increase or decrease by the following number of parcels/percentage:

Preservation 5992 parcels (51%)
 Conservation 2860 parcels (24%)
 Development 2903 parcels (25%)

- Field studies to inform land use guidelines.

Given our industrial history, it is sometimes hard to fathom the import and value of the remnant and recovering forests of Allegheny County. The botanist found a high diversity of woody species within each of the sites and evidence of four typical forest community types in the three areas sampled. They identified 84 woody species in total: 66 of which were native (=79%), and 13 of which are native hardwood trees (15%) (See Table 1). Many trees were greater than two meters in circumference and one tree at exceeded three meters in circumference. The steep hillsides of Pittsburgh indeed sustain a diverse assemblage of tree species with their attending shrubs and understory trees. Four hardwood forest native plant communities were identified on the hillsides studied. (See Appendix A for complete descriptions of these forest types):

- _____ **Dry oak**– mixed hardwood forest, typically occurs on slopes with dry soil
- _____ **Red oak**– mixed hardwood forest, occurs in mesic soils and found on lower slopes in our survey
- _____ **Sugar maple**– basswood forest, often occurs on rich soils with rocky slopes and supports a rich vernal flora .
- _____ **Mixed mesophytic forest** - typically found on lower slopes, which is unique to the Southwestern portion of Pennsylvania, and supports an extremely rich and diverse flora.

The Geologist comments on the three major site areas, was cautionary. Site studies illustrate the importance of field checking maps of geological hazards and soil types as part of the final decision on the suitability of hillside land for development. Section 4.2 “Understanding the Soil Survey for Planning goes into more detail on this topic.

In Conclusion

Our studies illustrate the fact that there is available data upon which a hillside zoning plan can be written. Given the authority of the United State Department of Agriculture and the City of Pittsburgh, the soil data and infrastructure data are legally defensible sources applicable and indeed intended for land-use decision making. The field studies provide potent tools for informed land use guidelines, and a rational overview of the value of our remnant and recovering forests. The contextual analysis and open space analysis help us see the current patterns and baseline condition today. This report provides the committee with authoritative work on ecology, our colleague have provide equally thoughtful input on design, economy and law. We believe that we have had some success clarifying

PHYSICAL REPORT EXECUTIVE SUMMARY

The hillsides of Pittsburgh are a remarkable natural resource, interlacing and complementing the densely constructed built fabric of Pittsburgh neighborhoods with dense woods. Steeply sloped land in Pittsburgh occupies approximately one-fifth of the area of the city. Most of it is covered by natural vegetation and some is exposed rock. For various reasons, very little of this land is "developed"-that is, occupied by buildings or other man-made features. However, the slopes are not preserved or protected in their natural state although they provide functional, aesthetic, environmental, recreational and other public benefits. How much of this land should be protected to maintain the many beneficial functions it provides? How can Pittsburgh capitalize on this unique natural asset in a sustainable way?

This investigation of the ecological and physical environments is intended to assist the City of Pittsburgh Hillsides Committee with its deliberations and recommendations regarding the future use of Pittsburgh's hillsides. This report focuses on the relationship between Pittsburgh's hillsides and its built form and how the natural characteristics inform and shape the built environment. The report also addresses implications and offers recommendations for future hillsides development. Utilizing a slope classification system contained in the Soil Survey of Allegheny County, Pennsylvania, the report defines "hillsides" as areas of 15% or greater slope and differentiates between two classifications in its recommendations: slopes of 15% up to 25% and slopes of 25% and greater.

At the city-wide scale, the physical setting is studied from its overall development impact on the city's settlement patterns, its spatial structure, the shaping of its neighborhoods, views and vistas, and urban texture. At the more localized hillsides scale, typical hillside development prototypes are identified that give Pittsburgh a unique identity. From these findings, two development strategies are recommended: redirecting development and restricting development. Three study sites, indicative of typical hillside conditions, are studied, and the use of the development prototypes is tested.

The report utilizes descriptive observations of the built form, identification and application of prototypical patterns, and development precedents from other hillside ordinances as the basis of the investigation and recommendations. GIS database material from the City of Pittsburgh and Allegheny County has been used to generate, document, or illustrate information.

Strategic Question

Pittsburgh is not facing growth pressure and has no shortage of vacant or underutilized land. High vacancy rates have been avoided only by demolishing housing, closing schools, and abandoning commercial property. Pittsburgh's shortage is in people and businesses to occupy the property already developed and to provide a healthier tax base for the city.

The strategic question for Pittsburgh is how to capitalize on Pittsburgh's hillsides as a means of attracting people and businesses while redeveloping and revitalizing its existing urbanized areas. For the purpose of Pittsburgh's revitalization, what is the "highest and best use" of hillsides? In a society where cities vie for people and businesses, how does Pittsburgh increase its competitive advantage? When and where does private construction distract from—rather than contribute to—the overall economic value of the city? What types and extent of construction should be permitted?

Historically, Pittsburgh's hillsides, because they were inaccessible and smoke-covered, were not highly valued development sites. Today, steep slopes can attract development because of good views or natural surroundings. But they do not lend themselves to development easily. They impose serious development constraints and exact added costs, both private and public.

The City of Pittsburgh has formally adopted in its Environmental Performance Standards of the Pittsburgh Zoning Code an affirmation of the benefits of the hillsides to the city, a commitment to preserving those benefits, and the need to develop the operational mechanisms to do so:

"The city's natural resources and sensitive environmental areas, steep forested hills, prominent ridges and rivers are major contributors to Pittsburgh's distinctive character and high quality of life. Provisions should be intended to protect sensitive environmental areas from adverse development impacts. Provisions should be developed that are intended to:

- Encourage the protection of steep slopes, riparian corridors, and other natural resources, while promoting economic development;
- Promote the public health, safety, and welfare of the residents of the city; encourage high quality development and orderly community growth; and
- Conserve and stabilize property values."

Pittsburgh's hillsides shape its public realm, contribute to the green and healthful character of the city and the identity of its neighborhoods, maintain the integrity of the natural ecology and the economic functioning of urban life, and provide aesthetic, historical and cultural continuity.

The goal of Pittsburgh's public policy regarding its physical form is to integrate the construction of built environments and the cultivation of natural environments into a single system that provides for a good and sustainable quality of life. Development on hillsides has greater potential to impact the health, safety, welfare, environmental, and aesthetic values of the Pittsburgh community than development on flatter land. Hillside preservation, conservation, and limited as-of-right development are an appropriate recognition of these values.

With this policy as its core principle, the Steering Committee articulated an expanded definition of the value of hillsides in Pittsburgh and a statement of

the purposes that the recommendations in this study are to address. The principles described in the report are the basis for a common vision for the future of the hillsides.

In order to assess the appropriateness of developing hillsides, the conventional framework for considering the value of natural environments is reconsidered, as discussed in detail in Stephen Farber's paper, "Economics of Hillside Slope Development". The value of hillsides is not just to produce revenue for the city. They offer broader economic, functional and social benefits. More fundamentally, the conventional "non-organic" model of urban settlement is premised on a fundamental dichotomy between humanity and nature, embedded in our culture, our concept of "development", and our patterns of production. This model has led to an alienation of our urban society from nature and the misuse of our resources. A new and better model looks to re-integrate them, creating a holistic framework for improving and sustaining the quality of city life.

To understand the role of the hillsides in Pittsburgh's identity, it is necessary to understand Pittsburgh's urban form, especially the characteristics that make it unique. The major factors are its geomorphology (its natural land form), settlement patterns, its spatial structure and texture, its neighborhood identity, and its views and vistas.

Pittsburgh's Urban Form

Geomorphology: Geologically, Pittsburgh is sited on the Allegheny Plateau, once part of the bed of a huge inland lake. Its slopes and valleys were formed by an erosion process rather than by folding and uplifting. The slopes are not the gentle folds of New England towns or the dramatic tilted planes of the west. They are steep "walls" of river corridors incised into the flat plateau, more like the Palisades of the Hudson. Pittsburgh's geographical form creates large spaces or outdoor "rooms" connected by corridors or "hallways" with flat terrace floors and steeply sloped walls.

Except for some neighborhoods in the East End, almost all of Pittsburgh's residential development is on sloped land. The hillsides provide neighborhood boundaries, dictate our transportation systems, provide most of the open space within the city, and form the backdrops and frames for views and vistas. Other than the rivers, the slope-walls are the dominant natural features that create Pittsburgh's "sense of place."

Settlement Patterns: Early development was on the flattest areas of the city as well as the slopes that bordered these areas which were not too steep for residential development. The Hill District, Polish Hill, the Southside Slopes and areas of Lawrenceville were the earliest slopes to be developed. The flood plain "flats" were developed for mills and manufacturing, surrounded by dense res-

idential development. In general, the slopes were impediments to access and high terraces remained largely undeveloped until mid-20th Century. Today, the slopes that are the most natural are those in areas developed after 1895, while the slopes that have densest traditional development were those developed before 1855.

Spatial Structure: The spatial structure of a city is what provides its perceptual legibility. At the scale of the city, the elements that provide continuity in Pittsburgh are the rivers, highways, and steep slopes. Major arterials, following the topography, generally parallel the slopes. The slopes also divide neighborhoods from each other, sometimes wrapping neighborhoods with a continuous band of wooded land. In sum, the hillside slopes, which parallel major paths, define edges, reinforce districts, and form portals, are arguably the most important single element in the legibility of the city.

Urban Texture: The "texture" of a city describes the effect of the buildings and open spaces as if seen from a great distance. The densely built fabric of the city contrasts to the natural open spaces and woodlands within the city. In Pittsburgh, local neighborhoods have their own texture and are easily distinguished from each other and from the natural areas that often separate them. In between the well-defined built and natural areas there sometimes exists sporadic development, which does not exhibit any orderly pattern. This occurs where new development at a larger scale has been inserted or where significant disinvestment has destroyed the historic urban texture.

None of the dense development of the city occurs on the slopes over 25%. Within the city there exist large continuous areas of steep slopes without development. Areas of development that have continuous urban fabric are primarily residential neighborhoods with buildings of small footprints. Dense industrial and commercial areas have tended to deteriorate or be replaced over time, leaving very little urban texture. A strategy of infill development would strengthen the coherence of urban texture where it has been weakened and create a stronger contrast to natural areas.

Neighborhood Identity: Pittsburgh has physically distinct neighborhoods and has frequently been described as a "city of neighborhoods". Their physical and social boundaries reinforce each other, resulting in "urban villages" that tend to be much more self-contained than in typical cities in the US. It is one of the distinctive characteristics that attract people to Pittsburgh. It also contributes to the social and economic sustainability of the neighborhoods, which offer small-scale pedestrian-oriented environments.

While the slopes can be perceived as barriers to movement and transition within the city, they reinforce the city's strong neighborhoods by creating distinct edges. In Pittsburgh, where neighborhoods tend to be densely built, natural wooded slopes provide an especially distinctive neighborhood edge. To insure

that Pittsburgh's neighborhoods continue to offer a uniquely attractive way of life, the slopes which form the boundaries of the neighborhoods should be reinforced, as well.

Views and Vistas: Views are significant in urban environment not only for their aesthetic value, but also for orientation and identity. The scenic quality of landscape views is highly correlated with the "unspoiled" character of natural environments. The verticality of hillside slopes heightens their aesthetic impact because they occupy so much of the visual field. Solidly wooded slopes create Pittsburgh's "green walls", which terminate view corridors throughout the city as well as form backdrops for panoramic vistas. Natural slopes not only give visual relief but allow for more compact higher-density development. Higher urban densities, which are related directly to the efficient use of public resources as well as contributing to urban character, are considered more livable when access to natural open space is provided. The density of Pittsburgh's neighborhoods is not oppressive because they are surrounded by open space.

Slopes that are highly visible, due to exposure or to a relationship to a high-volume transportation corridor, are most critical to protect from development. Critical areas for protection include not only the face of the slope but also the crest and, to a lesser extent, the land at the foot of the slope.

Pittsburgh's Hillside Development Patterns

Whereas the geomorphic qualities of the hillsides formed city-wide development patterns, the intermediate scale of the hillsides presents a more complex relationship of topography, development and open space. There are distinct hillside development patterns caused by the steepness of the slopes that occur nowhere else in Pittsburgh. These patterns provide the fundamental basis for recommending future hillside development that will maintain the character of the city.

Four hillside development types (prototypes) were observed to have identifiable and distinctive development patterns:

- No Development
- Developed Edges
- Ribbon Development
- Grid Development

A fifth prototype, Scattered Development, where individual buildings are randomly located on hillsides, was also identified. However, it is either a remnant of disinvestment or an anomaly. This report's recommendations do not encourage scattered development.

Prototype A "No Development" encompasses those slopes and hilltops that remain wooded and not developed. They appear as landscaped open space often forming edges to the river valleys and provide a landscaped backdrop to

the built environment. These hillsides are generally comprised of large parcels with few owners, most of it in public ownership. Due to their steepness, pedestrian paths and steps may be present. These undeveloped slopes are in the parts of the city settled after 1900. Examples: Hays, Lower Washington Boulevard, Highland Park near the VA Hospital, and areas west of the Parkway West beyond the Fort Pitt Tunnel.

Prototype B "Developed Edges" occurs when both the top and bottom edges of the slopes are developed and the slopes remain as open space between. The remaining undeveloped and landscaped slopes may be narrow, but discernable, as development extends down from the top and up from the bottom where the slopes transition to a steeper profile, however most slopes of this type have large, undeveloped and wooded open spaces. Examples: The northern face of Mt. Washington, the hillside along Bigelow Boulevard, the Duquesne/Mercy/SoHo slope, Troy Hill, and Fineview.

Prototype C "Ribbon Development" occurs when a center section of a slope is significantly developed as a building corridor dividing the vertical hillside into two or, possibly, three bands alternating between structures and landscape. There may or may not be edge development at the top or bottom of the slope. Green hillsides are interrupted by strong linear development along a street or streets that follow the slope contours. Development is concentrated along the road crossing the slope. Examples: Arlington Road on the South Side, 18th Street on the South Side, Sycamore Street in the Mt. Washington saddle, the edges of Polish Hill, and Spring Hill.

Prototype D "Grid Development": These slopes are basically developed from top to bottom. Limited interruptions, such as minor cliffs or small portions of 25% and greater slopes, are located within the prototype. Buildings tend to have limited or no setbacks and tend to be immediately next to sidewalks or streets. The building pattern is not always visible in the summer because the buildings are beneath the tree canopy height. Examples: The South Side Slopes at Mission Street, Upper Lawrenceville, Polish Hill, Herron Hill, Bloomfield, Lawrenceville, and Upper Oakland above Fifth Avenue.

Anomalies: Anomalies occur when development breaks the characteristic pattern. Usually in the form of single structures, they are undesired because they are significantly different from their context. They are intrusions and uncharacteristic of their context. Tall buildings on hillsides are anomalies. Most hillside buildings are no more than three or four stories in height and do not extend higher than the tree tops. They exist "within" the tree canopy. Wide buildings are a second type of anomaly. Wide buildings are a consequence of large-scaled, generally dense, development that tries to maintain a low building height. Typical examples are attached townhouses on hillsides or an occasional institutional building. Color and

materials can also become anomalies when they significantly contrast with their natural setting or their neighbors. Anomalies are of more concern when they are highly visible by large numbers of people. Hillsides that form the walls defining the river valleys and the hillsides of heavily traveled valleys, where they are easily visible from major arterials are in prominent locations where controls are more necessary.

Redirecting Development

Pittsburgh's greatest challenge is to restore its economic viability. Having lost more than half of its population over the last sixty years and the major sources of economic production, the city struggles to maintain a tax base and an acceptable level of public services. The city may have "bottomed out" in the last ten years, but it has yet to escape the downward spiral. Its most recent strategy has been to sell off its public assets. This would likely mean, among other things, encouraging increased private development of open space, especially publicly-controlled property. Ultimately, as in business, this would be a self-defeating strategy.

A more promising strategy is to recognize the assets that make Pittsburgh unique and attractive, and enhance those features for the purpose of increasing population and private enterprise. This is a strategy that has been pursued successfully by a number of increasingly affluent cities, including Denver, CO, San Clemente, CA, and Burlington, VT. In the competitive environment of American cities today, Pittsburgh must make itself a city of choice.

Disinvestment has left significant vacant land within existing neighborhoods and other developed districts. Derelict vacant sites generally detract from the livability and economic value of the surrounding area. They must be maintained in order not to create a nuisance or a health hazard. They represent a lost opportunity in terms of neighborhood open space or public revenue, if developed, from property taxes.

The sites that are serviced with existing infrastructure are more economical in terms of public expenditures. New public infrastructure, such as streets, curbs, sidewalks, lighting, and sewers, do not have to be extended. Replacement or upgrading infrastructure is far more economical and may be the responsibility of the property developer. If improvements are made by the City for infill sites, they are more likely to benefit other property owners in the vicinity.

A policy of encouraging infill development over new "greenfield" development also saves the ongoing costs of extending the public infrastructure. The City is already unable to maintain its existing infrastructure, and any new revenue from property taxes should be applied to existing maintenance rather than to creating additional infrastructure that will require additional maintenance.

Pittsburgh will attract a new more affluent and educated population by strengthening its sense of place, its distinctive identity. Reinforcing the physical structure of the city, especially the "mosaic" quality of its neighborhood-based form, can be more economically advantageous than collecting taxes on a few new hillside buildings. Protecting and maintaining "unspoiled" green hillsides is as important as bringing new development to older deteriorated districts of the city.

A number of initiatives would come from a clear public policy that identifies the strategic importance of the hillsides and regulates their development to make them a more effective tool for economic development. Such actions would include, for example, removing paper streets and property subdivisions from hillsides that should not be developed. High visibility slopes should be protected from development. Other initiatives are presented for consideration in Section 9 of the Physical Report.

Recommended Guidelines for Hillside Development

This study recommends that hillside development regulations be adopted and mapped. The recommendations here are intended as guidance for the design of those regulations, to be developed later. They are not intended to serve as "design guidelines." Design guidelines, although helpful in defining good quality development on hillsides, are not enforceable or necessarily equitably applied. Pittsburgh's hillsides are too significant an asset not to be rigorously controlled.

General Goals

Maintain the essential natural characteristics of Pittsburgh such as major land forms, vegetation and wildlife communities, hydrologic features, scenic qualities and open space that contribute to a sense of place.

Reinforce the image of Pittsburgh as a city which is shaped largely by and integrated with its natural surroundings, particularly in areas where natural features help to define the urban edge.

Retain the integrity of predominant views of hillsides, both of and within, to maintain the identity, image and environmental quality of Pittsburgh.

Ensure that hillside development is designed to be sensitive to the existing terrain and other significant natural land forms or features.

Encourage compact and appropriately-scaled development, screened by trees where possible, in hillside areas where development is allowed to occur.

Policies

Significant natural systems and resources associated with hillside environ-

ments, including ridgelines, vegetation and wildlife habitat, special geological features, natural drainage watercourses, steep slopes, and important historic or cultural features shall be maintained.

The visual character of hillsides shall be maintained, recognizing the importance of the exposure of hillside development to public views and the importance of providing panoramic views from the hillsides.

The right to live in Pittsburgh's hillside areas goes concurrently with the responsibility to build in an environmentally sensitive manner.

Hillside Development Patterns

Maintain and create ecological landscape corridors into and around the built form, including "bridging over" development when necessary, to maintain Pittsburgh's landscape and reinforce the city's characteristic balance between the landscape and built environment.

Encourage the completion of existing development edges to strengthen the continuity of the built form, rather than build on new or formerly-developed parcels elsewhere on a slope. Streets that parallel the crest or foot of a slope make stronger edges than other streets, as well as provide public access to views and the natural environment. Buildings that face onto these parallel streets make strong edges.

Encourage infill development on existing and vacant parcels where possible to reinforce the built fabric and strengthen the differentiation from the natural open space. Seek to intensify existing neighborhoods and in the process minimize infrastructure construction and public maintenance.

Visibility of Slopes

Two degrees of hillside development visibility are recommended, Highly Visible and Less Visible. Hillsides should be mapped according to their visibility.

Preservation of Natural and Unique Features

Rather than a policy that encourages development to override the environment, development should respect and reinforce the natural features of Pittsburgh and preserve its unique qualities. Among these are:

- Its geological features: dramatic bluffs, river and stream valleys, flat terraces, and escarpments.
- The native trees and plants of Western Pennsylvania.
- The native habitat.

Slope Crests

Maintain the natural crest edges wherever possible. Prohibit clear cutting of trees at crest edges.

Where development occurs on crest edges, restrict building heights so that buildings appear to be "within" the tree line or tree canopy. Where development has already occurred, new development should match the existing in terms of scale and profile so long as the existing development conforms to the patterns and other development recommendations suggested.

If new streets are created at tops of slopes, locate them between development and the crest to create a public edge. Position buildings on the upland portion of the lot and away from the crest of a hill to maintain a clear sense of the hillside brow in a natural condition when viewed from major roadways and other off site public viewing places.

Portals

Prohibit development within 600 feet of designated tunnel portals. This seems to be the typical distance of private development from tunnel entrances. Land at the entrances is publicly owned and usually extends 600 to 800 feet horizontally from the actual entrance. A distance greater than 600 feet is desired, if achievable.

Prohibit development within 1,000 feet of a designated valley portal. Because these portals are larger in scale than tunnel entrances, the non-development distance should be larger. 1,000 feet is somewhat arbitrary, although it is the general distance most development now steps back from these valley portals. Further investigation of this distance requirement is recommended.

Buildable Slopes

Limit development on slopes with stable conditions as follows:

- No development restrictions, other than typical zoning regulations, on slopes of 0% to 15%.
- Restrict development on slopes of 15% to 40%.
- No development on slopes of 25% to 40% within High Visibility designated areas. Exceptions would be infill sites where no hazardous conditions exist.
- No development on slopes of 40% and greater.

Characteristic Development Pattern

Assign Development Pattern Types to specific hillside areas:

- No Development Pattern: The entire hillside zone should be preserved as natural landscape, with no buildings on the slope, at the crest, or at the foot of slopes.
- Developed Edges Pattern: Buildings should be located only along the crest or foot of the slope, and conform to applicable regulations.
- Ribbon Development Pattern: Buildings would be permitted at the crest

and foot, and on infill sites along a designated street along the face of the slope.

- **Grid Development Pattern:** Buildings would be permitted on infill sites within an existing grid of streets on the face of a slope, as well as at the crest or foot.

No scattered site development would be permitted on slopes over 15%. Development would not be permitted on any site that would require extension of street or sewer.

Soil and Geotechnical Conditions

No development should be permitted where it would have an adverse effect on the health, safety, or welfare of any person regardless of slope percentage. Generally, these involve environmental hazards such as stability of soils, high water tables, and hydrologic hazards. See the Ecological report for further information on environmental hazards.

Use of Existing Infrastructure

Prohibit development on vacant parcels served only by steps, except for infill locations. Do not extend street and utility infrastructure beyond existing locations. Restrict the location of buildings in relation to infrastructure to maintain existing development patterns.

Stormwater Retention on Site

Prohibit development on any slope greater than 40% and to significantly restrict development on slopes greater than 25%. Paving on slopes greater than 25% is the most detrimental type of development and should be restricted to public rights of way. Any parking on such sites should be provided within the building and included in the building envelope restrictions.

General Hillside Development Guidelines

Existing Pittsburgh Standards

Where the existing regulations and standards are consistent with these recommendations, they should remain in force. It is recommended that changes, in the form of amendments, should be made to the existing texts and maps, rather than by introducing new legislation. The city's various standards should be made consistent with an overall hillsides policy.

Use

On slopes greater than 15% allow only residential uses as-of-right. Other uses, such as institutional, religious and cemeteries, should be by conditional use only and highly regulated to fit the context. Other uses should be prohibited.

Restrict permitted residential uses to one- or two-unit buildings. Townhouses as well as apartment buildings should be prohibited.

Allow public use of hillside open space for passive recreational use, such as hiking, where ecologically appropriate.

Consider permitting certain agricultural uses, such as orchards.

Density

Development on slopes, either as developed edges or ribbons, should match the local neighborhood density rather than conform to an across-the-city standard.

Building Locations

Keep infill and edge development as close to existing development as possible, consistent with local density. Dwellings should be placed far enough apart to reveal views of the hillcrest. Set maximum setback distances from roads on hillside sites.

Existing trees should be preserved so that vegetation provides a backdrop to the structure. Except where new infill buildings are located within a grid or ribbon development, buildings should be seen against retained vegetation rather than the sky.

Streets

The maximum street grade should not exceed 12%, which is consistent with good planning standards (23).

Hillside street design should minimize grading by aligning streets with the topography, running roads along natural ridges or valleys and working with existing grades where possible. Consider reducing or splitting street sections to minimize grading.

Generally reduce the width of street improvements, reduce sidewalk widths and use common driveways to minimize impact.

On-Street Parking

Allow for parking on only one side of hillside streets, if at all. Parallel parking can be eliminated to reduce road width in critical areas and then provided for in off-street bays or community parking lots at more suitable locations.

Street Lighting

Maintain a minimum of street lighting in hillside areas dominated by landscape. Locate street lights only at all intersections and where necessary to reduce traffic hazards. Continue the existing street lighting when extending development patterns. Shield street lights from off-site views, except when

specifically desired for connectivity and way-finding reasons.

Street Trees

Street trees should be installed in random patterns in hillside areas. Any trees that are provided should be native or similar to natives and should be arranged in natural-appearing clusters.

Utilities

Utility housings for transformers, control points and other utility housings should be located as to minimize their visual impact and should be safely screened with fencing and vegetation. No utility housings should be permitted in front yards.

New hillside development of more than one parcel or one building should be required to bury all utility services, such as electrical and telephone lines.

To the extent permitted by federal law, prohibit cell phone towers, commercial antennas and similar structures within 500 feet of high visibility slopes 15% and greater.

Creeks, Streams and Rivers

Build no closer than 100 feet to daylighted watercourses on hillside sites. Allow no stormwater runoff off site, except directly into an adjacent creek or stream.

Site Specific Design

Lot Size

Maintain lot sizes and dimensions based upon the prevailing neighborhood context. Control building placement on hillside properties.

Building Siting

Site the building on the least sensitive portion of the site, as close to the street as possible, to preserve natural landforms, geological features, and the landscape.

Orient parcels and buildings toward views and vistas at right angles to contour lines. Maintain the typical Pittsburgh building face to street relationship the same as on flat land parcels.

Buildings sited to maximize views at the expense of vegetation should be denied. Exposure of the building should be no more than 50%.

Set back at least 50 feet from cliffs, ridges, and hilltops so that the structure does not appear to be perched on the edge.

On uphill sites, buildings should build to front lot lines to reduce hillside grad-

ing disturbance. On downhill sites, buildings should minimize the front yard setback to reduce building massing hanging over the slope. Private rear yard space can be provided with a small yard, terrace, or deck.

Open Space

Regulate open space by controlling building footprint and placement on the site. Provide yard space between lot lines for trees and natural vegetation and to space buildings from one another. Open space should remain natural to the greatest extent possible, with the majority tree covered.

Site Grading

On slopes of 15% to 25%, limit site grading to the minimum necessary to provide for building and parking. Regulate the maximum area of allowable site disturbance.

Grading should preserve the natural shape of the land, especially at the horizon so as not to result in artificial terrace effects. Prohibit terracing for a large building or paving. Discourage uniform stair-stepping of building pads, unless it continues an existing building pattern.

Sharp angles at the top and toe of cut and fill slopes should be prohibited. When slopes cannot be rounded, vegetation should be used to alleviate a sharp, angular appearance. A round and smooth transition should be made when the planes of man-made and natural slopes intersect.

Some codes are explicit in their maximum slope and heights of cut and fill, which should be considered. Good practice indicates:

- 2:1 maximum cut slope adjacent to the public right-of-way with the guarantee that landscaping and maintenance of all slopes outside the right-of-way be maintained (18).
- 3:1 maximum unretained slope (11).
- 4 foot maximum height of unretained fill on slopes of less than 20% and 6 feet on slopes 20% and greater. Excess fill or cut to be contained by retaining walls or hauled off site. Maximum height should not exceed 8 feet in any combination (cut and retaining or fill and retaining) (11).

Recommendations for maximum disturbance require further engineering study. On slopes of 25% or more, the property developer should be required to provide an engineering study for all proposed re-grading.

Stormwater Control

Establish minimum stormwater retention, detention, and infiltration requirements following PWSA/DEP standards/guidelines, as applicable. One hillside ordinance requires a minimum of 2 hours based on a 10-year storm and released at a controlled rate equal to the runoff rate generated by the site in its natural condition, with a maximum of 0.2 cubic feet per second per acre (11).

Daylight roof drainage systems on all buildings on slopes greater than 15%, however this is good practice regardless of slope.

Preserve natural entrance and outflow points. Drain swales should be designed to minimize their visibility; they should be angled along a slope rather than creating an abrupt 90-degree intersection with contour lines. Do not allow ponding of water above cut or fill slopes and divert surface water away from cut faces and sloping surfaces of a fill.

Control the amount of impervious material permitted. Use pervious materials for driveways and patios instead of concrete and encourage wooden decks.

Site Improvements

The driveway should not be the predominant feature of a front yard. Generally, driveways should be eliminated by locating parking adjacent to the right-of-way. Shared access to parking should be encouraged.

Free-standing walls integral to a structure should be of the same material and design as the structure. Their maximum height should not exceed 6 feet, however a 4 foot height is recommended.

Retaining walls should be designed with smooth, continuous lines that conform to the topography. Maximum wall height at the base of slopes along roadways should not exceed 5 feet in order to avoid a contained, channel-like effect. Retaining wall structures holding back grade to accommodate a patio or terrace should conform to the natural hillside profile as much as possible. Retaining walls over 10 feet high should be prohibited, however a maximum of 5 feet or 6 feet above final grade is recommended. Multiple parallel walls should be designed to be part of a tiered or terraced retaining wall system and conform to the above height recommendations.

Site Vegetation and Landscape Design

Skyline planting should be used along developed crests and slope edges, including locations between buildings, to create a continuous treetop silhouette and provide either a backdrop or a setting for structures. In general, crest line trees should be taller than the structures so that the buildings are within the tree canopy.

Planting on the slope side of development should be designed to allow for controlled views out, yet screen and soften the architecture. In general, 50% screening of a building's view façade(s) is recommended. In grid development zones where edge planting at lower levels of a slope may block the view from parcels above, height restrictions on plant materials should be applied.

Restrict the removal of trees to avoid clear-cutting. Require replacement of all removed trees that are 6 inches in caliper to restore the site to its previous tree

density before grading. 3 inch caliper trees should be the minimum size for new trees. Consider requiring that twice (2x) the total caliper of removed trees be required to restore the site, with any excess trees planted on publicly-owned land. Or consider requiring one tree per 150 square feet of natural area as required in Santa Clarita (18) and similarly required in other cities.

Allow only native tree planting on slopes 15% and greater. It is important to maintain visual continuity of these species and sustain fall colors.

Site Lighting

Shield all site lighting so that the light source (lamp) is not visible from 30% below the fixture. Outside lighting should be muted and directed so that it does not spill over and onto neighboring (including downhill) properties. Follow IES standards documented in LEED guidelines.

On-Site Parking

Parking should be provided within the envelope of hillside structures and, when not possible, by means of closely regulated open parking bays. On sites with grades no more than 25%, allow a maximum of one exterior space per residential lot, no more than 20 feet deep of paving and located immediately adjacent to the street.

Building Specific Design

Building Massing and Footprint

Compact development should be maintained through small footprints and minimum setbacks, thereby minimizing grading and making development less obtrusive. Single buildings are preferred. Attached townhouses should be limited to duplex units on hillsides.

On slopes greater than 15%, require new development to match the existing neighborhood massing and footprint pattern.

Setbacks

Place the building as close to the street as possible to preserve the natural terrain. Consider imposing 0 foot front yard setbacks or mandating continuation of adjacent existing setbacks on hillside sites where appropriate. Maintain minimum side and rear yard setbacks as presently regulated.

Building Height

Restrict heights of buildings within 100 feet of slope crests to the height of the natural tree canopy or a maximum height of 35 feet or 2-1/2 stories facing a street and 45 feet or 3-1/2 stories at the rear when facing a downhill slope, whichever is lower, measured from the lowest elevation grade to the top of the roof ridgeline. Half to fully-exposed basements on the downside of the slope would constitute a full story.

Restrict the heights of buildings at slope toes to a maximum height of 40 feet or 3 stories, whichever is less. Do not locate high-rise buildings on slopes or within 100 feet of the foot of a hill.

Building Profile

Proper scale is visually important and particularly so in high visibility slope areas. Limit the area of a single plane of façade to no more than 1,000 square feet so that the scale of the building is maintained generally consistent with the scale of a typical Pittsburgh residence.

On slopes greater than 15%, buildings should be required to have peaked or sloped roofs of at least a 4:12 profile. Flat roofs should be prohibited unless developed as "green" roofs.

Orient buildings perpendicular to the street so that the view façade is the narrower façade of the structure.

Color, Building Materials and Architectural Features

Colors of buildings should be selected to blend with the natural colors and hues of the surrounding hillsides. All exterior materials and colors, including roofs, walls and fences, should be predominantly muted earth and plant tones and should minimize contrast and glare. Roof colors should be of darker tones: browns, blacks, and dark grays. White and other bright colors should be avoided.

The maximum light reflectance of colors or materials used for building walls, trim, decks and architectural features should not exceed 60%. The light reflectance of exposed foundations, stone, brick, concrete and concrete block walls, including retaining walls, should not exceed 35%. Roofs should also have a 35% maximum reflectance.

Reflective coatings, such as chrome or reflective glass, are not appropriate on hillsides. Rough-textured, fire-retardant roof materials are recommended.

Large windows should be subdivided into panes. Large expanses of glass on south-facing slopes should be avoided as all glass is reflective depending on the sun angle.

Architectural compositions should be vertical in nature. Horizontal façade patterns, particularly those with protruding horizontal bands, contrast with the typical Pittsburgh building type and should be discouraged.

As a general rule, avoid using wide decks and other architectural features elevated on posts. Decks should be small-scaled and it is suggested they protrude no more than eight feet nor be wider than fifteen feet. Multiple decks are pre-

ferred rather than a single deck. Limit the extent of exposed undersides of buildings to 8 feet in depth and height of posts, when used, to 10 feet.

Foundations

When building on slopes, a fully enclosed structure should meet the ground. Stilt-supported buildings should be prohibited.

The foundations of all buildings on 15% and greater slopes should be designed and certified by a professional engineer. The foundation's design should follow the natural contours of the hillside with minimal exposure. Avoid high foundation walls, but when necessary extend the building's siding material or veneer finish to within three feet of grade level.

Rooftop Utilities

Avoid rooftop utilities over one foot in dimension unless these appurtenances would be completely screened from view by solid architectural elements compatible with the building's profile and character. Rooftop utilities should not exceed the building height limitations.

Three Test Sites

Three study sites were investigated in more detail to test development ideas and the recommendations. Several factors were considered in their selection:

- Examples of prototypical Pittsburgh slope conditions and patterns of development.
- The type of geography: edge, hill, or corridor slopes.
- Their potential for development pressure, either now or in the near future.
- Their location in Pittsburgh to achieve a good representation of typical hillside conditions.

The intention of this exercise was to look at hillside characteristics, test the application of the development prototypes, and understand where development and open space needed to be more carefully structured. The specific recommendations were tested to confirm the recommendations, not to apply them to specific parcels.

The sites selected by the built form team and the Steering Committee were:

Duquesne Heights: The south-facing slopes to the north of Sawmill Run Road (Route 51) from the West End to eastward of the Fort Pitt Tunnel entrance by Chatham Village. This site represents highly visible corridor slopes with heavily wooded hillsides. Much of the area is within existing Greenway or Parks and Open Space zoning designations.

Middle Hill District: The south- and west-facing slopes north of the Boulevard of the Allies from the western edge of SoHo, upper Fifth Avenue, to West Oakland and northward encompassing Aliquippa Terrace. This is a smaller

area of wooded hilltop slope that contained historic development which experienced major disinvestment. This area has proximity to an area of Pittsburgh with little designated open space and has the potential for development pressure from nearby large institutions in Oakland and from the Pittsburgh Housing Authority.

South Side Slopes: The north-facing slopes of the South Side extending from the eastern-most edge of Grandview Avenue on Mt. Washington eastward to encompass most of the South Hills slopes that front onto the Monongahela River. This is an edge slope condition with the strongest development pressure in Pittsburgh. The area has a range of development types from steep undeveloped slopes to dense residential urban fabric. The area includes the Mt. Washington saddle.

Each site was examined for the following:

- Steep slope locations, with 15% to 25% and 25% and greater slopes identified. The intent was to understand the continuity of these slope classifications and their relationship to one another.
- Street locations, including paper streets and "stair" streets. Parcels not serviced by streets shows where development could occur.
- Hydrology, including surface water and sewer locations, to understand storm water conditions of the urban fabric.
- Ownership patterns, including public and private ownership and designated open space. Ownership shows where development pressures exist as well as the potential for open space protection.
- Mapped infrastructure, showing sewer lines, streets, and parcels and the areas most likely not serviced by them. Sewer line locations, along with streets, determine the infrastructure's ability to service development.
- Undermined locations. These locations provide a good picture of where historic mining activity occurred and the potential for future instability. Not mapped was the depth of the mines, which is a more significant factor in determining instability.
- Neighborhood identity, showing perceived boundaries, the major hillside paths that service them, and "hard" and "soft" development edges where the neighborhoods front onto hillside open space. These factors helped to understand how hillside neighborhood edges are formed and which edges are more effectively defined.
- Zoning designations currently applied to the study site. This information provided good information on those areas designated as parks and open space and the areas designated hillsides.

Two types of development actions are recommended:

1. Develop vacant infill sites to strengthen the prototype pattern.
2. Discourage development where sites should be incorporated into open space.

In certain locations selected open space should be improved for public use.

Duquesne Heights:

- Apply Developed Edges prototype aggressively.
- Maintain continuity of open space.
- Maintain and enlarge the open space surrounding the tunnel portal.
- Infill neighborhood edges to strengthen ragged crest with typical neighborhood residential buildings.
- Limit development at the foot of the slopes.
- De-map paper streets and parcels and convert to open space.
- Apply strict site and building development controls to maintain neighborhood pattern.

Middle Hill District:

- Increase the open space at the base of the eastern slope by claiming disinvested property utilizing the Developed Edges prototype.
- Utilize the Grid Development prototype to extend and integrate the neighborhood fabric with the public housing. This is an instance where built form is more advantageous than additional open space.
- Increase the amount of open space to strengthen the setting for the upper terrace public housing and to eliminate scattered development on the highly visible portion of the slope.
- Increase tree planting at the tops of the slopes to break down the scale and ribbon impact of the public housing and soften the visual ridge tops.
- New construction on the public housing sites should conform to the standards for crest development.

South Side Slopes:

- Apply the three prototypes, Developed Edges to the west, Ribbon Development to the center, and Grid Development to the east as shown.
- Develop infill sites for each prototype area.
- Discourage scattered site development on hillside above Ribbon Development.
- Maintain the continuity of the natural hillsides by not extending pattern development further onto the hillsides and discouraging scattered or any other development of hillside land.
- Do not allow attached townhouse development, other than duplex units, on any site.
- Impose strict building heights along the crest line so that the tree line dominates the ridge silhouette.
- Maintain small lot and small building footprints so that buildings will remain in scale with one another and in scale with the hillsides.
- Enforce the use of proper building colors and materials so as not to create visual anomalies.
- Plant only native species to maintain visual continuity and fall colors.

All of these sites exhibited evidence of multiple prototypes. They proved to be very helpful in understanding the underlying development pattern and suggestive of development strategies. They were also useful in making the case for protecting

and, in some instances, increasing the open space.

The prototypes were most useful in guiding future development recommendations, which are more of a planning guidance nature than site-specific controls. What became apparent in each test site was the idea of completing the patterns, whether it be by filling in neighborhood edges to make them stronger and more recognizable, encouraging the infill of ribbon development so that these swaths of buildings do not appear as scatter-site development, or just filling in the vacant parcels within the existing street grid with the Grid Development prototype.

They were also useful in making decisions about open space. In the Middle Hill District site, the problem is the narrowness of the open space and natural hillside landscape. By applying the Edge Development prototype over disinvestment properties it became apparent that converting this formerly developed area into future open space provided the land area and vertical height to make a significant open space and setting for the public housing at the top. It places the housing into a better scaled relationship with the hillsides and provides much needed open space for the neighborhood residents. On the South Side Slopes site knowing where to encourage open space helps in deciding where development should stop.

What becomes important with the prototypes is the ability to maintain the continuity of the landscape and the continuity of development where either is appropriate and desired.

Other Potential Controls

Development Environmental Impact Analysis

All development on slopes 15% and greater should be required to prepare a Development Environmental Impact Analysis.

Suggested reports that comprise the Development Environmental Impact Analysis, covering impacts on the immediate site and the surrounding area, might include:

- Geologic and soils characteristics report.
- Grading or erosion control report that would also describe all site retaining and other proposed site improvements, including methods of preventing on-slope slippage and erosion.
- Vegetation and preservation report including tree caliper measurements, a proposed tree replacement plan, and a tree-screening plan of the proposed building.
- Hydrology and storm drainage report describing provisions for storm drainage and sewage disposal, how the drainage plan will meet PWSA daylighting requirements, and the downstream effects of development.

- Safety protection report describing site access by emergency vehicles as well as site improvements intended to lessen the impact of fire.

Development Site and Building Plan

All development on slopes 15% and greater should be required to prepare a Development Site and Building Plan that describes the development aspects of the proposed project. The Plan should include a detailed description of the proposed site and building plans, plus a visual analysis that describes how the building will be seen from off-site and in relationship to its hillside and landscape context.

Maintenance of Hillside Property

The Ada County, Idaho, hillside ordinance has a very interesting maintenance clause that should be considered for Pittsburgh:

"The owner of any private property on which grading or other work has been performed pursuant to a grading plan approved subject to the regulations of the Hillside Overlay Standards shall maintain in perpetuity and repair all graded surfaces and erosion-prevention devices, retaining walls, drainage structures, ..., and plantings and ground cover installed or completed. Such requirements shall be incorporated into the protective covenants for a subdivision and the conditions of approval for development applications."

The clause could be strengthened by having it also apply to building and other construction not covered by a grading permit.

Require a bond to guarantee the completion of revegetation plans, the stabilization of grading sites, cuts and fill, and construction/maintenance of storm water runoff facilities for several years after the completion date.

Require the owner to provide a maintenance covenant or notice in any deed conveying the property to another, particularly where the development is not part of a subdivision or planned community and has no protective covenants in its basic legal documents.

Design Review

All development on slopes 15% and greater should be required to submit site and building plans for design review by the Zoning Administrator. All development which seeks to extend a development pattern on slopes 15% and greater should also be reviewed by the City Planning Department for compliance with the hillside's physical and development characteristics to assure that this new development maintains the desired development pattern. This two-step design review makes a distinction between infill and development extension sites. Infill sites would only require review by the Zoning Administrator. Development extension sites, because of their greater impact on the hillside development pattern, would receive more scrutiny.

Any hillside development design review should look beyond the typical use and massing review to also look at the aesthetic qualities of the landscape and building design. Tree placement and screening, the visual impact of site improvements, the visual impact of the building's design and profile, materials, colors, utilities, and other significant features of the building and site should be reviewed. The basic criteria should be compatibility with the development's hillside landscape context, both from on-site and off-site perspectives.

Appropriate visual material should be provided for the design review. In addition to the usual site and building plans and elevations, computer simulation, sight-line analysis, and models should be considered.

Taxation of Hillside Parcels by "True Cost" Method

At the present time differential taxation would require an amendment to the Pennsylvania Constitution as all real estate taxation must be uniform. Consider the following as ideas that might begin a community dialogue on this subject.

Consider adjusting real estate taxation to account for higher on-going infrastructure and public safety costs that would reflect the "true" or "full" costs of hillside development. Higher taxation rates might apply to buildings on slopes of 15% and greater, with the rate increasing as the slope percentage increases.

Consider incentives to redirect Pittsburgh development to infill sites and non-hillside sites. Provide tax incentives to live on neighborhood infill sites.

- Lower or eliminate property taxes on undeveloped/unimproved hillside parcels on slopes of 15% and greater.
- Create tax incentives for development on vacant infill sites within all neighborhoods.
- Do not incent development on vacant infill sites located at the edges of neighborhoods bordering on hillside open space.
- Create impact fees or other disincentives for development on new sites on slopes of 15% and greater that extend an existing neighborhood development pattern, with the penalties increasing as the slope percentage increases.
- Create an impact fee for developing on sensitive hillside and other sensitive sites where it would be in the public's interest to encourage preservation.

Consider other taxes and fees based on user impact.

- Storm water user fees based on the amount of impervious surface proposed on hillside sites.
- Automobile parking usage fee based on the narrowness of hillside streets and the inability to provide on-site parking.
- Adjust building and other permit costs to reflect the full cost of providing infrastructure for site improvements.

- Charge impact fees or other disincentives for developing adjacent to public hillside open space.
- Require that utilities charge true or full costs of utility infrastructure for any extensions on hillside properties of 15% slope and greater.

Taxation of Hillside Parcels by Hillside and Open Space Market Value

Recognize the value of slope edge properties in the tax assessment rates.

- Increase the assessed values of slope ridge/edge parcels to more accurately reflect their true market value.
- Gradient assessed values from open space edges to infill locations, with the higher rates at the edges of open spaces

This is another form of differential taxation and is presently unconstitutional. An alternative strategy might be to offer tax abatement on non-hillside development as an incentive, but not on hillside development

Other Funding for Hillside Preservation

The district option appears to be similar to that of an authority in Pennsylvania. Establishing a hillsides authority might be an option if city residents and the state could be convinced that it was in their interest to protect hillsides as open space.

Density Transfer Options

Some form of density transfer option should be given serious consideration. If development rights, or higher densities, be transferred from sensitive hillside areas, such as those proposed within the Highly Visible slope areas, to infill sites elsewhere in Pittsburgh where increased densities could be absorbed, hillside open space could be preserved or, at least, hillside densities lowered. Another possibility would be to sell hillside property density development rights to fully-serviced, tax-delinquent and repossessed infill properties in existing neighborhoods. This transfer of development rights would not only support the infill strategy discussed in this report but would also generate income for the city. Transfers would need to be an option, not a requirement, for them to be legally acceptable.

EXECUTIVE SUMMARY – LEGAL REPORT
LAND-USE CONTROLS FOR HILLSIDE PRESERVATION IN
THE CITY OF PITTSBURGH

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Prepared for Perkins Eastman Architects

Although it is a Pennsylvania Home Rule Municipality, the City of Pittsburgh (the City) obtains its authority to adopt land use regulations, including zoning regulations, from legislation adopted in 1927, not the Pennsylvania Municipalities Planning Code. Land use control ordinances, such as zoning and subdivision ordinances, are an exercise of the police power entrusted to the City under the enabling legislation and the City's Home Rule Charter. These ordinances are presumed valid and any challenger must carry a heavy burden to establish that they are not.

To be valid when applied to a particular parcel of land, a zoning regulation must (1) be substantially related to the protection of a legitimate public purpose, (2) not be arbitrary, capricious, nor an abuse of the City's legislative authority, and (3) not deprive an owner all reasonable economic use of its land.

A land use regulation is valid when it promotes legitimate police power purposes • protection of the public health, safety, morals, or general welfare. Its provisions must be substantially related to the purpose it seeks to serve. Pennsylvania courts have attempted to maintain a sensitive balance between the need of the public to adopt regulations for public benefit and the right of private property owners to make reasonable use of their property. They grant a presumption of validity to police power regulations, including zoning regulations. This presumption is not easily overcome. However, the municipality must act in a manner which does not sacrifice the constitutionally protected rights of its citizens. Whether a regulation serves a legitimate police power interest involves a balancing of the interest to be served and the rights of the landowner to make reasonable use of its property.

The City's enabling legislation sets forth several public police power purposes to be served by zoning regulations that readily encompass regulations to protect and preserve hillsides or steeply sloped land within the City and hillsides views from locations within the City. The same section of the enabling legislation specifically requires that zoning regulations "be made with reasonable consideration, among other things, to the topography and character of the district, with its peculiar suitability for particular uses, and with a view to conserving the value of buildings and encouraging the most appropriate use of land throughout such city." This language invites regulations that respect and preserve the City's distinct hillside development patterns where that "character" is appropriately defined or described in the regulations. Pittsburgh' unique development patterns, the prototypes described elsewhere in the larger REPORT, provide a sound basis for these regulations.

A regulation may be found to be arbitrary where it results in different treatment of similarly situated properties without providing a reasonable basis for that difference. The

nature of a significant hillside slope suggests the reasons for treating the sloping land differently from flat land.

Successful “regulatory takings” challenges to police power regulations are relatively rare. Successful challenges allow the court to weigh the impact of the regulation on a specific parcel of land. Sometimes, this impact will be so severe as to deny the owner any reasonable economic use of its land, overcoming the presumption of validity and swinging the balance in favor of the property owner. The Pennsylvania “regulatory taking” analysis parallels that of the United States Supreme Court, so that the Pennsylvania and federal tests are essentially the same.

A zoning regulation that is intended to preserve the character of the City by protecting its steep hillsides from the dangers of over-development or to preserve the City’s character should be found to serve a legitimate police power purpose, particularly when reference is had to the purposes of zoning as set forth in the City’s enabling legislation. As long as the owner of the zoned parcel is allowed some reasonable use of its property, the regulation should also satisfy the “regulatory takings” test.

There are few Pennsylvania appellate court decisions evaluating hillside protection regulations. One case upheld a zoning ordinance preserving steep slopes, forests and woodlands, and streams in a particular development district. The other upheld an ordinance prohibiting timbering on landslide prone land anywhere within the municipality. Both ordinances survived reasonableness and “regulatory takings” challenges.

Hillside or slope protection zoning is a relatively new zoning objective. Hillside protection zoning ordinances have been upheld in five states on substantive due process grounds. One state found the regulations unconstitutional because transfer development rights were used to compensate landowners in preservation districts for their loss of all development value. The state’s constitution required that compensation be in the form of money; the granting of development rights did not satisfy this requirement. A lesson from this case is that one must not get too greedy in the efforts to restrict private property for public benefit. The property owner must be left with some reasonable economic use of its land if the regulation is to survive a “regulatory takings” challenge, unless what the property owner proposed to do with its land would amount to a nuisance. No one has a constitutional right to use their land to create a nuisance, as by increasing the danger of landslide or surface water flow to neighboring public or private properties.

The existence of administrative relief from the strictures of the regulation by way of a variance can greatly reduce the risk of a successful “regulatory takings” challenge. The variance granting agency can conduct the intensely factual inquiry required in “regulatory takings” cases and tailor relief that both protects the essential objectives of the regulation and the landowner’s right to make reasonable use of its property.

It is exceedingly tempting to bottom many hillside preservation measures solely on aesthetic values. However, the Pennsylvania courts have not looked with favor on regulations designed primarily to serve aesthetic values. In Pennsylvania, a ‘municipality may include aesthetic factors in the exercise of its zoning powers, but aesthetics alone

cannot justify zoning decisions.” Thus, where aesthetic considerations support other legitimate police power objectives • “provide adequate light and air; to prevent the overcrowding of land; to avoid undue concentration of population; to facilitate the adequate provision of transportation, water, sewerage, schools, parks and other public requirements, they should be upheld.

Pennsylvania's courts have long held that land-use activities by some other governmental agencies are or are not subject to land-use control authority of a municipality, while others are not. Where the legislature has expressly stated that a state agency is subject to local zoning control, that intent will be given effect. The question is one of legislative intent. The City's zoning enabling act provides evidence of legislative intent that the City's requirements pre-empt less restrictive provisions of conflicting state statutes. Where the conflicting statutes are silent on this question, the court will employ traditional principles of statutory interpretation to find that intent.

The City of Pittsburgh's land-use control enabling legislation makes reference to a "major street plans," "official street map," and "street plats." The "major street plan" is an element of the City's master plan. No building may be erected on a lot unless “the street giving access to the [lot] ... shall have received the legal status of ... a public street ...” or is shown on the “official street map” or “or unless such tract, lot or parcel has been created or transferred in compliance with this act [subdivision regulations].” Where a dedicated street has not been actually opened and used within 21 years of the offer of dedication, the City's power to accept that street ends. The vacation of existing paper streets in development sensitive areas would serve to reduce pressure for undesirable development as would a determination of those offers of dedication shown on the City's official street map that have now expired.