JULY 1, 1993
LCMR FINAL STATUS REPORT - DETAILED FOR PEER REVIEW -- RESEARCH

I. MODEL RESIDENTIAL LAND USE GUIDELINES - LAND 18

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A. M.L. 91, Ch. 254, Art. 1, Sec. 14, Subd. 10 (h)

Model Residential Land Use Guidelines: This appropriation is to the University of Minnesota, Department of Landscape Architecture, to illustrate and disseminate residential land development guidelines that address a broad range of environmental concerns. The work must be done in consultation with the Metropolitan Council. The legislative commission on Minnesota resources may convene a steering committee to ensure coordination and practical results.

Budget:

a. Amount Budgeted (LCMR) $150,000

b. Balance: $0

B. Not applicable.

C. Not applicable.

II. NARRATIVE

A. Statement of Problem: Local subdivision standards direct the physical arrangement of housing on the land (i.e. the dimensions and arrangement of houses, lots, and streets and required infrastructure) through the subdivision design and platting process. Studies in the areas of energy, storm water management, water quality, and housing affordability have identified that many of these standards for new housing mandated by local subdivision regulations can cause significant and costly environmental damage. These impacts tend to be directly and indirectly the result of blanket subdivision requirements which cannot be adequately varied to meet site-scale variances in natural environmental factors such as soil, topography, and vegetation community.

The incidence and degree of such impacts are to a large extent due to the spatial relationships made manifest in the subdivision layout, utility and grading schemes as a result of the influence of subdivision regulations. For example, the relationship of required pavement areas and their micro-scale positioning relative to runoff flow paths and receiving waters is critical to water quality concerns for non-point source pollution. The widths of the pavements are explicitly specified and their lengths and positioning is implicitly specified in local zoning and subdivision regulations. Taken together, they promote certain pavement patterns and exclude others. From a water quality standpoint, the pavement and runoff management patterns typically designed into new subdivisions tend to create problems rather than prevent them. In Minnesota, many local subdivision controls exclude the use of more

environmentally sound development patterns that have been devised in other regions to avoid impacts.

This project contributes to the remedy of this situation by : (1) Identifying and quantifying the environmental costs attributable to the subdivision design patterns resulting from typical Minnesota residential land development standards so their significance can be understood; (2) Identifying, adapting and codifying for use in Minnesota, appropriate and tested environmentally sensitive alternatives to these standards that provide practical, defensible options for local public officials and legislators. The transfer and adoption of the knowledge developed in this project would be a logical and necessary project which would need to occur, for reasons of logical sequence, time and budget, subsequent to this project.

It is important to understand that this project proposes to assess only those impacts generated by the regulatory requirements of local subdivision controls which influence the design and layout of physical relationships of elements in new subdivisions, and not the state and federal level controls which are designed to monitor and mitigate environmental effects of new subdivisions. Also, this project does not intend to quantify and tabulate the aggregate future environmental effects of all subdivision development in Minnesota. Instead its focus is upon assessing the relative differences between status quo and alternative approaches to subdivision development controls in generating adverse environmental effects.

B. Importance: This year, new non-point source water pollution elimination regulations will be implemented by the U.S. Environmental Protection Agency, that will require a rethinking of all urban land design conventions to meet national water quality objectives. Authority for achieving environmental objectives in new housing developments is segmented among several Federal, State, county and local regulators making it difficult for any one authority to propose comprehensive solutions. Although the need for change is recognized by several local planning officials, none has the budgetary capacity and interjurisdictional perspective to develop comprehensive alternative models.

C. Extent of the Problem: Residential subdivision standards affect over 60% of newly developed Minnesota land -- five times more land than the next most land consumptive use: industrial. In many categories, environmental impact is directly related to the amount of land area affected. The economic cost of mitigating the avoidable environmental damage caused by such standards has had tremendous impacts on the social and economic environment. These costs have helped drive the home lot portion of new home prices from 15% of the total in 1950 to 35% today, pricing 9 out of 10 people in their prime family building years out of the home-buying market.

III. OBJECTIVES

A. Assess Environmental Impacts of Status Quo Land Development Standards

A.1. Narrative: This objective is to clearly identify the status quo of land development standards in new suburban areas, and then measure the impacts attributable to those standards. Because impacts tend to compound when individual standards are combined in their application to design whole subdivisions, the environmental cost of maintaining the status quo in land development standards must also be examined in that context. For this reason, the impacts will be assessed through the use of actual projects which reflect status quo standards. The specific impact issue areas examined will focus on environmental objectives embodied in published policies affecting Minnesota communities which are affected by the spatial controls applied in regulating the subdividing process. These include but are not

limited to: stormwater runoff, downstream flooding, non-point source water quality, ground water recharge, energy consumption, wildlife habitat, urban forests, soil erosion, neighborhood aesthetics and the cost of the land component of new housing.

A.2 Procedures:

(a) Gather and analyze existing subdivision regulations and zoning codes which control the physical form of new subdivisions from a representative sample of Twin Cities Metropolitan Area suburban cities.

(b) Develop a representative set of status quo standards. These will be developed from the information gathered in task (a) and will cover all facets of the physical design of subdivisions (e.g. -- minimum setbacks, road widths, storm sewer requirements, lot sizes, permissibility of natural drainage and cluster development, etc.).

(c) Review and criticize the representative set of status quo standards. Reviewers will include Metropolitan Council staff, as well as local public officials, developers and consulting professionals who provide subdivision design services.

(d) Revise the set of status quo standards as needed to correct discrepancies and errors identified in (c).

(e) Identify and document the health, safety, welfare rationale for each individual status quo standard using both library research and structured commentary solicited from the Metropolitan Council staff and other reviewers used in (c).

(f) Select ~~at least two completed plans~~ for Case Study #1 a completed plan for actual market-rate housing subdivisions which closely reflect the applications of the typical standards developed in tasks "c" and "d" and obtain permission to use ~~them as case studies in this study~~ it as a case study. By using completed plans for actual subdivisions, the project will be able to use the environmental impact assessment information already developed for each project, realizing a great saving in data gathering and impact analysis costs for both the site and the development program. For Case Study #2, select an undeveloped site in an emerging community and design a new subdivision according to the status quo standards.

(g) Using the two case studies, identify, quantify and catalog the environmental impacts of construction, use and maintenance attributable the status quo standards. Because of the generic focus of this study, this task will be limited to the use of readily available data from standard sources, and data already gathered for the actual case study sites.

Another important limitation is that this impact analysis will focus on those impacts which arise from the physical site design pattern dictated and promoted by the status quo standards. This means that the focus of the impact analysis will be on physical changes which have spatial implications, measurable in terms of length, area, volume, character of surfaces, and relative position of elements. For example, runoff discharges and volumes can be developed using the S.C.S. TR-55 method from measurements of different site surfaces and their configuration in plan. In another example, energy consumption related to site configuration can be measured in terms of the embodied energy required to create and maintain surfaces (energy costs per unit area to produce and maintain paved surfaces can be directly applied to surface quantities measured from plans).

In all cases the development program -- the number of dwelling units per site -- will be assumed to be constant, eliminating the need to explore differences in impacts on social and political issues in depth, especially with respect to government social services needed to support the new development. Economic impacts relative to cost of physical development and housing affordability will be measured assessing the cost of site

improvements against household income profiles obtained from census data. In the case studies, actual development costs could be used instead of estimates. Aesthetic impacts will be assessed using expert evaluation rather than visual quality assessment survey techniques, and will draw heavily upon landscape architectural and urban design literature as well as behavioral literature regarding proxemics and spatial affordances.

(h) PRODUCT: Draft report documenting the results of (g) and the work upon which it relies.

A.3. Budget:

a.	Amount Budgeted (LCMR)	$43,000
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the value of the work done for this task is considerably greater than that reflected by the amount shown above. Based upon fees charged for comparable studies which have been conducted in other regions of the U.S. by professional landscape architectural consultants, the above amount would have to be multiplied by a factor of 2.0 to 2.5 to yield a comparable market rate fee.

A.4. Timeline for Products/Tasks:

	July 91	Jan. 92	July 92	Jan. 93	June 93
(a) Inventory existing regulations	••••••				
(b) Analyze regulations and develop status quo standards	•••				
(c) Review and verify status quo standards		•••			
(d) Revise status quo standards		••••			
(e) Obtain case study subdivisions	•••				
(f) Identify health, safety, welfare rationales for status quo standards		••••••••		XXXXXXXXXX	
(g) Assess environmental impacts of applied status quo standards			••••••••••••	XXXXXXXXXX	
(h) Draft report			••••••••••••		XXXXXXXXXX

A.5. Status:

The development ordinances for seventeen third ring developing suburbs of the Twin Cities were inventoried and compared. This inventory included subdivision design standards, zoning codes, PUD ordinances, zoning overlay districts, and engineering standards. These standards were arranged in a matrix to allow a comparison among the seventeen cities' development regulations. From this matrix, a representative set of "status quo", or existing, design regulations was compiled. The actual number that occurred most often (the statistical mode) was used to represent the typical regulatory requirement, which produced a new set of status quo requirements. This set does not actually represent any of the seventeen cities studied; it represents a composite set of development standards consisting of the most common requirements among the seventeen cities. The PUD regulations, while claiming to allow greater latitude in design, have in reality de-facto status quo requirement standards. Some cities will allow the negotiation of housing density, some minor fluctuations in street width or lot sizes, but there is a base-level of zoning standards for PUDs beyond which they will not "negotiate". PUDs are used mainly for development projects that are desired by the city, but could not possibly be construed as fitting into the usual development and zoning regulations -- golf courses, and shopping malls are prime examples.

Viewing the status quo development matrix, where the dimensional standards of each city are displayed side by side, it is overwhelmingly obvious that the development requirements are practically identical among all seventeen cities. Street widths, building setbacks, utility easements and street rights-of-way, gradients, and engineering standards combine to create an identical pattern of land development regardless of environmental sensitivity, community needs, or the great differences in the physical landscape between different cities. Together, these standards describe only the placing of utilities within given dimensional corridors; the width of street rights-of-way according to amounts of anticipated daily traffic, the width of utility corridors on front, side, and rear lot lines, the minimum and maximum lot length and width, the various setback requirements for different building types, and the arrangement, size, and maximum lengths of lot arrangements. Having accomplished the appropriate "sizing" of lots, cul-de-sac bulbs, street rights-of-way, utility easements, and setbacks, the regulatory requirements for the design of our cities have been satisfied.

We met with area professionals in city planning, engineering, fire safety, architecture, landscape architects, urban designers, and real estate developers in order to discuss the rationale for each of the existing development standards we found in the seventeen development ordinances. We found that the perceived need for these standards, as evidenced by the testimony of local experts, is based on an unnecessarily limited range of choices and development considerations based on "rules of thumb" and tradition. These standards exist not because they make the best place to live, but because they meet the current definition of public health, safety, and welfare that they were created to protect: public health as sewage being kept out of drinking water, public safety as a reduction in potential traffic accidents, and public welfare as convenient auto access to regional shopping and jobs. We searched for empirical evidence in several hundred journals, several international data-bases and research publications that would support the existing regulations claim to empirical evidence of "sizing requirements" that protect the public's health, safety, and welfare, but failed to find any support for these positions.

The existing status quo development regulations control only the sizing, placement, and design of utilities, street right-of-ways, and building setbacks. One is left with a highly serviced pad to build a shelter on; we call this "making a utility pad," but no connection to a larger community setting. We were left with a collection of development regulations and standards, and a set of assumptions and commonly held beliefs that justify them. In the end, we can only speculate that these standards have become traditional within the planning and engineering professions because they have not been substantially challenged.

As we initially proposed, we chose two case study sites, both completed market rate subdivisions in Plymouth, Minnesota. Our original intention was to compare two different case study sites; one a completed subdivision, and the other, an undeveloped parcel of land, in order to quantify and compare the differences in stormwater runoff, site disturbance, impervious surfaces, etc., but we found that even with nearly identical standards applied to the two, the differences in physical changes were impossible to compare because the impacts of development are site specific -- a measurement of any type of disturbance in one site cannot be objectively compared to the same measurement on another site. The information gained from a comparison of two different sites would be meaningless. We realized that we would have to use the same sites for our two case studies, and apply different sets of standards to the same pieces of land in order for the numerical comparisons to be effective. For this reason, we chose to use two completed subdivisions in Plymouth, located across an existing arterial roadway from each other, as our two case study sites.

We measured the physical changes and environmental costs in the case study site by comparing the completed development, built to status quo regulatory standards, to the site's pre-development condition. From the map information provided by both the city and the development engineering firm for the subdivisions, we measured the following changes: impervious soil cover (sq. ft.), pervious soil loss (total cut - total fill) in cubic feet, annual pollutant loading (lb.), total soil cut (c.y.), total soil fill (c.y.), vegetation by area (sq. ft.) and length of perimeter (linear ft.), the critical vegetative buffer zones both in area (sq. ft.) and perimeter (linear ft.), both the eliminated and disturbed natural drainage ways (linear ft.), the total area changed by cut and fill (sq. ft.), and the total amount of land dedicated to public open space (sq. ft.).

We found an expected increase in disturbance after development, along with a loss of natural stormwater drainage ways, which resulted in an increase in the amount of stormwater runoff; we found an increase in impervious surfaces (streets, driveways, and roofs), an increase in annual pollutant loading, and a net loss of vegetation, and pervious soil.

Although the environmental impacts of status quo development are significant, the measurements we made do not begin to assess the social and economic impacts of design regulations. We found that we are using zoning to size and place the utilities, roads, and parcels, and in essence we are making a service-enriched utility pad, the small piece of land left on the lot on which we can build. This utility pad is, in essence, the "net private domain."

Prescribing a new set of dimensional standards to replace the status quo would have had little effect on the "net private domain", but could increase the environmental quality of the public domain. The existing regulations only describe the size, placement, and design of individual utilities, roads, and parcels, and the environmental changes can only be considered cumulatively. Thus, the assessment made it clear that a new way had to be found to change the cumulative physical structure of a subdivision. That is: from an assembly of isolated individual utility pads whose physical structure keeps people apart; to a physical structure that brings people together by building a commonwealth, a public domain of shared interests, a common-unity or community.

A.6. Benefits: Assessment of the environmental costs attributable to locally mandated standards for new subdivisions will provide valuable information about the environmental effects of maintaining the status quo by regulatory authority. Currently this cost is virtually unrecognized and unmeasured in Minnesota communities. The ability to understand how and why these standards were developed will assist communities in understanding how to trade-of the status quo standards for other considerations such as environmental, community building, diversity, and affordable housing issues.

B. Identify And Adapt Proven Development Standards Which Can Eliminate Conflicts And Avoid Impacts Identified In Objective A.

B.1. Narrative: A critical aspect of any environmental assessment is the evaluation of alternatives. Environmentally sensitive alternatives to the status quo standards identified in Objective A have been developed and applied in other regions of the U.S., (such as *Performance Streets*, a street design policy developed by Bucks county Pennsylvania). However, most are narrowly focused and have been developed in the context of specific issues, such as street network design, stormwater management, energy, and affordable housing. This objective seeks, selects and interprets environmentally sensitive alternatives, for use across the full

spectrum of environmental objectives, adapting them for use in Minnesota's climate and landform conditions.

B.2 Procedures:

(a) Using literature and existing applications, identify social, economic, and environmentally sensitive alternatives to status quo standards which offer potential to avoid or greatly reduce the impacts identified in Objective A, yet still meet the identified health, safety, welfare goals.

(b) Identify, catalog and quantify the environmental impacts of construction and continued use and maintenance attributable the environmentally sensitive alternatives. This would involve basically the same work as in A.2(g). Again, the impact analysis will focus on the effect of physical changes which have spatial implications (measurable in terms of length, area, volume, character of surfaces, and relative position of elements) on relevant environmental issues. At this level a general comparison with status quo standards would be applied, attempting to identify the most promising alternatives in terms of potential flexibility gains and potential reductions of lengths, areas volumes, and proportions of types of surfaces in ways that would yield improvements in overall performance.

(c) Review and criticize the environmentally sensitive standards. Reviewers will include Metropolitan Council staff, as well as local public officials, developers and consulting professionals.

(d) Revise and refine alternatives as needed to correct problems identified by review and comment.

(e) PRODUCT: Identify and illustrate comprehensive strategies for using alternative standards in the context of the case study subdivisions. These strategies will be primarily physical design strategies which influence the design and layout of housing subdivisions. Special emphasis will be placed upon aspects related to length, area, volume, character of surfaces, and relative position of elements, which are normally controlled by zoning regulations and subdivision standards.

(f) PRODUCT: Draft report of findings to guide and direct Objective C.

B.3. Budget:

a.	Amount Budgeted (LCMR)	$31,320
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the market value of the work done for this task is 2.0 to 2.5 times greater than that reflected by the amount shown above. (See A.3 for further explanation).

B.4. Timeline for Products/Tasks: July 91 Jan. 92 July 92 Jan. 93 June 93

(a) Identify environmentally sensitive ~~alternative standards~~ guidelines ••••• XXXXXXXX
(b) Evaluate and illustrate alternative ~~standards~~ guidelines ••••••••• XXXXXXX
(c) Review alternatives ••••
(d) Revise, refine and codify alternatives ••••
(e) Identify and illustrate comprehensive ategies for using alternative ~~standards~~ gui ••••• XXXXXX

(f) Draft report to guide and direct Objective C ••••• XXXXXX

B.5. Status:

We examined the designs of approximately 250 planned communities and cities in the United States to find alternative physical design choices to the status quo standa[illegible] planned residential communities in a search of over 800 journals, books, articles, pamphlets, and brochures printed from 1850 to the present. We compiled a computer database of the planned communities, and built a related photographic slide collection of over 1200 slides illustrating these communities. We used the compendium of articles, books, and slides to evaluate these communities in terms of their potential to avoid or reduce the physical, environmental, social, and economic impacts we had identified in Objective A.

We had to postpone procedure (b) of this section for the following reasons: the environmental impacts of construction are site specific, and only their cumulative effects can be evaluated. First, we had to design a new community on our case study sites in order to measure the combined effects of all of the considerations and decisions that impact the final form of a residential community. How those decisions affect a given site is dependent on the nature of the site itself; its hills and valleys, its trees, grasses, and shrubs; the way water moves over and under its surface, and the way all of these systems combine to make habitat and special landscape features. From our findings in Objective A, we wanted to measure more than just the environmental effects; we wanted to find a way to help the individual pieces add up into a larger collective whole, a physical structure from which a neighborhood and community could emerge, stabilize, and sustain itself.

We developed our new alternatives within a framework of expanded choices for development. The problem with the status quo development standards is the homogeneity they produce. Any innovative idea, or even wise use of landscape resources is usually impossible to build; by the time one pushes a design through the sieve of regulatory sizes, lengths, widths, and placements, it all ends up looking the same. We propose a new frontier of choice -- a frontier that encourages less of the procedural democratic process, where development decisions are made through the bureaucratic machinery of "public hearing and due process," and more emphasis on a participatory process, where the interests of the community are given a value in the decision-making. This new frontier emphasizes the making of a physical landscape, rather than the transactional landscape of easements, utility ROWs, building setbacks, and functional classification of roadways. This frontier emphasizes the building of our commonwealth: the places, connections, and things that we hold in common, the things where we have a shared interest. The health of our private wealth is dependent on the quality of our commonwealth.

We developed alternative principles by analyzing the historical examples of successful community building gleaned from library research and our data base of 224 planned communities. The resulting alternative principles of development include an assessment of the features that exist in the place where development is contemplated; landscape features of the physical terrain: hills, bluffs, ravines, lakes, rivers, forests, prairies, fields, etc.; as well as civic features such as public buildings and squares, institutions, parks and parkways; and sacred places such as cemeteries, Native American cultural resources, churches, etc. Once these resources have been assessed, the community must ask themselves "what kind of place do we want to make?" The community must decide what approach it will take: whether to *preserve* in entirety a given resource, or whether to *conserve* it in some other fashion; whether to *restore* a resource or to *mitigate* potential ongoing damage, or whether to *reclaim* a resou[illegible] from a fallen state. Once these decisions have been made, a [illegible]s of development

choices can be negotiated. We proposed an expanded set of choices that cities, developers, and communities can use to build the type of places they envision: variable lot sizes and frontages, a new street hierarchy based on humanistic principles instead of functional traffic types, varied street and right-of-way widths, street events, civic easements for walkways and plantings, and the collective placement of residential housing with the service- and place-enriching features that are necessary for any neighborhood or community to emerge.

We reviewed and criticized our proposed alternative standards with Metropolitan Council staff, developers, professional designers, and city planners and engineers, in order to produce the workable alternatives that we used in Objective C.

B.6. Benefits: The identification and interpretation of environmentally sensitive alternative ~~standards~~ guidelines for use in Minnesota will provide decision-makers a context for comparison in understanding and evaluating the acceptability of the environmental costs associated with maintaining the status quo -standards. The presentation of the planned residential communities in America that have been developed since 1853 will provide a unique source of proven development patterns that communities can turn to in evaluating which status quo standards are appropriate and which may need to be modified due to the inclusion of other considerations.

C. Model The Integrated Application Of The Results Of Objective B On Case Study Sites.

C.1. Narrative: The same processes used to determine the environmental costs status quo ~~standards~~ guidelines will be applied to the environmentally sensitive alternative ~~standards~~ guidelines. As explained in Objective A, they must be evaluated in the context of practical application on the case study sites. This objective is to prepare alternative plans for the case study sites so that the combined effects of the environmentally sensitive ~~standards~~ alternative guidelines in applied situations can be identified and measured for comparison with the status quo effects.

C.2 Procedures: Prepare alternative design schemes for subdivisions on each of the two case study sites using the ~~codified~~ alternative ~~standards~~ guidelines and the strategies developed in Objective B. To maintain an objective basis for comparison, the number and type of dwelling units used in the status quo plans will be maintained, and standard landscape architectural site planning and design techniques will be applied. Schemes will be detailed to a sufficient level to permit environmental impacts to identified, catalogued and quantified. Case study designs using alternative ~~standards~~ guidelines will be periodically reviewed with Metropolitan Council staff and other outside experts, as in Objectives A and B, to assure quality and accuracy. Products will include drawings (e.g. plans, sections, etc.) and outline specifications for alternative schemes in sufficient detail to permit an assessment of impacts in Objective D parallel to that conducted in Objective A.

C.3. Budget:

a.	Amount Budgeted (LCMR)	$33,100
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the market value of the work done for this task is 2.0 to 2.5 times greater than that reflected by the amount shown above. (See A.3 for further explanation).

C.4. Timeline for Products/Tasks:

	July 91	Jan. 92	July 92	Jan. 93	June 93
(a) PRODUCT: Prepare plan for case study A			•••••xxxxxxxx		
(b) PRODUCT: Prepare plan for case study B			•••••	xxxxxxxxxx	

NOTE: Since the work on each of the two case study sites is primarily design work typical to standard professional landscape architectural schematic design, it may be conducted independent of the other site. There are no critical interdependencies inherent in the work which would affect project scheduling. Thus, scheduling becomes a matter of staffing. It is planned that a different designer would be assigned to each project, permitting the tandem prosecution of each task. The tasking and procedures for each case are identical in terms of the description provided under C.2 above.

C.5. Status:

We redesigned the two case study sites in accordance with the new guidelines we developed in Objective B. The new guidelines emphasize the success of private wealth as directly related to the quality of our commonwealth. The private wealth of homes, retail and commercial properties, and corporate offices is built upon the commonwealth -- the substructure of the land itself, its resources and capabilities; the infrastructure of the public streets and ways, and the superstructure of the anchoring institutions, landmarks, and places that support the social and economic structures of any human settlement. The physical form of communities has obeyed timeless principles for thousands of years; it is only is the last century that the values of urban form shift from making a community to making a commodity. These historical examples have clearly demonstrated that the long term value of private wealth is based on the relative quality of the commonwealth -- it is impossible to make private wealth without it.

We developed the following guidelines, derived from our study of hundreds of precedent communities, as the principles which have historically been applied to build a strong commonwealth. They are: connectivity, security, sustainability, and community.

Connectivity refers to being connected. Only in modern subdivisions do we see houses with their back yards facing the street. Each subdivision is a separate, isolated collection of houses. Each has its own entrance and circulating streets, usually ending in a cul-de-sac. Each of the houses, built on its own utility pad, is disconnected from the larger community, town, metropolitan area, and region. Connectivity means that the streets connect one place or activity to another, it means that the streets are not dividing strips of traffic conduit, but are connecting civic public spaces, capable of supporting the social and functional necessities of a neighborhood and community. These connected activities are the building blocks of a commonwealth, for without connections we have nothing we share in common. Connectivity rekindles the ability to make a larger collective whole out of smaller individual pieces; it makes the whole greater than the sum of its parts.

Security encompasses more than just safety. The status quo standards are full of regulations designed to increase traffic safety. They have effectively lowered the number of traffic accidents by decreasing the potential for conflict between parked and moving cars, between pedestrians and cars, and between differing traffic loads and speeds. Although the status quo street standards may have made our streets more *safe*, they have not made our communities more *secure*. One may not get accidentally run over by a car while crossing a street, but one stands a good chance of being shot in a drive-by shooting. Isolated homes built on utility

pads do not provide the kind of community surveillance of playgrounds and public places that a connected community does, because the residents of a connected community have a shared interest in those places. A recent article in the local newspaper described a ride-along conversation between a journalist and a convicted burglar. The burglar preferred to work in the suburbs, he said, because there is less traffic, because everything is further apart, and because neighbors don't watch out for each other's property.

Sustainability is more than just environmental or physical sustainability; it includes the social and economic welfare of our communities. It is the support of the long-term viability of the community.

Community, or *common-unity*, emerges from a shared interest in inhabiting a place. We don't inhabit sites, we inhabit places, regions, communities, and towns. Common unity develops from connected, secure, sustainable places, where citizens may have diverse values, but they have a shared interest in common ownership, in inhabiting the same place, and in making a sustainable community. The status quo design standards may support the functional physical necessities, but they do not sustain or enhance the quality of daily life. Community is a human form of sustainable habitat.

These four guidelines build a commonwealth by letting the substructure, the physical terrain itself, the landscape features and resources that can enrich a place, read through the superstructure, which is comprised of the anchoring institutions, built public spaces, cultural and historic features and resources that sustain our communities. In every precedent community that we studied, a strong commonwealth developed out of a visible substructure. The meeting of land and water, dramatic changes in elevation, bluffs, ravines, valued views; the commonwealth in each of these communities was organized around these features. By building a superstructure that lets the substructure show through, we can build a superstructure that adds meaning to a place. Each of these individual elements of super- and substructure are connected with built settings and ensembles into armatures -- civic armatures that enhance the environmental, economic, and social welfare of a community.

We reviewed our alternative case study designs with Metropolitan Council staff, developers, city planners, professional designers, watershed managers, and engineers. Their support was unanimously in favor of pursuing the alternative guidelines we had developed.

C.6. Benefits: Plans which demonstrate the application of the environmentally sensitive alternative ~~standards~~ community development guidelines identified and developed in Objective B will provide the essential base needed to assess the combined effects of the alternatives. They will also provide important examples of what the housing developments shaped by these alternatives will look like -- always a fundamental question in the acceptance of any new idea for shaping the environment. In addition, the community development guidelines will outline a process by which communities can make the necessary trade-offs between health, safety, and welfare status-quo standards and other considerations which will build viable and sustainable neighborhoods. These neighborhoods in turn build the larger community of cities and towns in the developing sectors of the metropolitan area and in growing counties and townships in the State of Minnesota.

D. Assess Environmental Impacts of Alternative ~~Land~~ Community Development ~~Standards~~ Guidelines

D.1. Narrative: This objective is to measure the impacts attributable to the environmentally sensitive alternative ~~land~~ community development ~~standards~~ guidelines identified in Objective B and demonstrated in Objective C. This will be conducted in same manner as the assessment of impacts generated by the status quo standards described in A.2(g).

D.2 Procedures:

(a) Identify, catalogue and quantify the environmental impacts of construction, use and maintenance attributable the environmentally sensitive alternative ~~standards~~ guidelines in terms of the effects of individual ~~standards~~ design and planning choices. This would provide for a general comparison of the differences in impact levels between status quo ~~standards~~ and alternative models. Specific impact issue areas examined will include: stormwater runoff, flooding, non-point source water quality, ground water recharge, embodied energy, wildlife habitat, urban forests, soil erosion, neighborhood aesthetics and cost of the land component of housing.

(b) Identify, catalogue and quantify the environmental impacts of construction, use and maintenance attributable the environmentally sensitive alternative ~~standards~~ community development guidelines in terms of their combined effects identified in the context of the case study subdivisions.

(c) Review findings with Metropolitan Council staff and outside reviewers for criticism and comment.

D.3. Budget:

a.	Amount Budgeted (LCMR)	$17,800
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the market value of the work done for this task is 2.0 to 2.5 times greater than that reflected by the amount shown above. (See A.3 for further explanation).

D 4. Timeline for Products/Tasks:

	July 91	Jan. 92	July 92	Jan. 93	June 93
(a) Assess impacts of individual alternative ~~standards~~ guidelines			•••••	xxxxxxx	
(b) Assess combined effects of alternative ~~standards~~ guidelines			••••••••	xxxxxxx	
(c) Review findings with review panel			•••	xxxxx	
(d) PRODUCT: Draft report of findings			••	xxxx	

NOTE: The work represented by the above tasks is essentially the same as that identified in A.2(g) and reflected in A.4(g). Some time savings are planned to be recognized in the mensuration and tabulation of lengths areas and volumes of impacts by developing designs under Objective C using computer aided design systems which automate such task to a much higher level than that anticipated for the similar work done on the actual case study plans in A.2(g).

D.5. Status:

We identified, catalogued and compared the environmental impacts of an existing status quo development, and a development designed with the alternative guidelines we developed in Objective B and applied to our case study site in Objective C. For the purposes of

comparison, the two developments are labeled "status quo" the development that was actually built in accordance with existing status quo standards; and "proposed," the development using our proposed alternative guidelines.

In virtually every category that we measured (see A.5. Status), the "proposed" development showed a lower environmental impact, with the following two exceptions:

One, the total amount of impervious cover was four percent more than the "status quo" development's. This can be explained by the inclusion of commercial and multi-family housing in the proposed development, which requires impervious parking areas. The "proposed" development also contains more linear feet of roadway, because the development is connected to the area streets and to the commercial and recreational areas, the branch library and to the neighborhood school included in the development; it also contains more park trails and street sidewalks. In combination, these added features create more impervious soil cover than the "status quo" development. However, it should be pointed out that this represents only a four percent increase from a development with no sidewalks, no neighborhood retail services, no parking areas, no multi-family housing, no branch library or school, and fewer trails and public open space. It also must be recognized that a more dense and compact development, while increasing impervious surface area, actually reduced many other impacts by orders of magnitude.

The second exception is the linear feet of natural drainage ways that were disturbed, meaning altered, but not destroyed. Each of the developments were measured for the linear feet of natural drainage ways that were 1) disturbed, and 2) eliminated. The "proposed" development would disturb approximately four times the length of drainage way that the "status quo" development disturbed (1638 ft. proposed compared to 400 ft. status quo). However, the "status quo" development completely eliminated three times as much natural drainage way footage as the "proposed" development (2500 ft. status quo compared to 88 ft. proposed). From this comparison we can see that the "proposed" alternative development actually has less of an impact on natural drainage ways that the status quo development because it is only disturbing and re-establishing them, not eliminating them completely as the "status quo" development does.

In every other category, the comparison is quite clear: the "proposed" development of alternative guidelines disturbed only twenty-two percent of the site compared to fifty-one percent of the status quo; the pervious soil loss dropped sixty-nine percent with the alternative development; and the total amount of cut and fill decreased by fifty-six percent. The environmental impacts are considerably lower using the alternative "proposed" development guidelines. However, we wanted to measure more than just the environmental impacts -- they can be quantified individually, but the cumulative effects can't be quantified except by examining how they are applied in total.

The alternative development contained thirty-three percent more land dedicated to a commonwealth (772,313 sq. ft. proposed compared to 579,003 sq. ft. status quo) than the status quo development. This translates into an increase of land in which the residents have a shared interest; an increase from thirty-six percent to forty-nine percent in public land, and a decrease from sixty-four percent to fifty-one percent in privately held land. The commonwealth of the proposed development is composed of public recreation areas (463,513 sq. ft.), institutions (a branch library and a school -- 128,700 sq. ft.), commercial properties (68, 750 sq. ft.), and the space of a civic street, scenic easements, and a civic armature (39,150 sq. ft.). The commonwealth of the status quo development is comprised only of park land (516,900 sq. ft.), and residential street rights-of-way (62,103 sq. ft.).

We reviewed these results with Metropolitan Council staff, developers, and planners. The response was overwhelmingly positive, not only in the research review meetings, but also in the public presentations of this material to national conferences of the Urban Land Institute, the Minnesota Builders Association, and the Sensible Land Use Coalition.

D.6. Benefits: Assessment of the adverse environmental effects attributable to environmentally sensitive alternative ~~standards~~ guidelines for new subdivisions will provide valuable information needed to compare the cost of maintaining the status quo by regulatory authority with the cost of pursuing alternative approaches. Comparisons conducted in other regions, based upon single environmental issues, suggest that substantial adverse environmental effects will be avoided or greatly reduced, at lower economic costs, through use of environmentally sensitive alternative ~~standards~~ guidelines . The new guidelines will also try to illustrate that we can also build sustainable communities if we begin to consider other issues such as community development, diversity, and affordable housing, to name just a few. Learning to proactively plan for neighborhoods in our developing suburban and exurban cities, towns, and townships, rather than creating transactionally and economically efficient subdivisions, will help emerging communities build a strong place-based economy, a stable social fabric, and a memorable place to inhabit.

E. Prepare Final Report and Model ~~Standards~~ Guidelines for Community Development.

E.1. Narrative: A pilot study conducted by the project manager identified that many Twin Cities Metropolitan Area planning officials and design consultants need alternatives to the status quo standards which have been adapted to Minnesota, and codified for ready application, together with supporting documentation. This objective will be to prepare a final report comparing and contrasting status quo approach with alternative ~~standards~~ guidelines and an annotated model standard with commentary to facilitate use by Minnesota cities.

E.2 Procedures:

(a) Prepare draft model subdivision ~~standard~~ guidelines annotated with specific supporting references and illustrations and guiding commentary needed to facilitate adoption in the context of existing regulatory structures.

(b) Review draft with Metropolitan Council staff and outside reviewers for criticism and comment.

(c) PRODUCT: Revise model subdivision ~~standard~~ guidelines as needed to respond to the results of task (b).

(d) PRODUCT: Prepare final report documenting all the findings of this study.

E.3. Budget:

a.	Amount Budgeted (LCMR)	$24,980
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the market value of the work done for this task is 2.0 to 2.5 times greater than that reflected by the amount shown above. (See A.3 for further explanation).

E 4. Timeline for Products/Tasks: July 91 Jan. 92 July 92 Jan. 93 June 93

(a) Prepare model ~~standard~~ guidelines .....
(b) Review model ~~standard~~ guidelines .....
(c) PRODUCT: Revise and finalize model ~~standard~~ guidelines as needed .....
(d) PRODUCT: Prepare final report .....

E.5. Status:

This is the major conclusion of the study: how does it all add up, and how can we make trade-offs and mitigate the cumulative impacts of development? These questions are more important than pursuing each impact individually. This conclusion has been agreed upon by every review committee meeting that we held. The Metropolitan Council members, city administrators, mayors and council members, developers, designers, and planners all agree that how we greatly expand the range of choices in the process is more important than the individual system impacts. We have to redefine public health, safety, and welfare to include the additional vital considerations of connectivity, security, sustainability, and community. We propose these four considerations as essential principles or guidelines based on timeless ways of building communities.

In order to achieve this we must redefine the due process from a procedural process to a participatory due process.

We must redefine *standing* in the law to give everyone who lives in place *standing* in the planning process. Today we don't just inhabit sites, we also inhabit settings, communities, metropolitan areas, and regions.

We must redefine the rights of private land ownership by restoring the incentives and responsibilities for the long-term stewardship of land that were operating at the time our most highly prized historical precedents of community building were created.

Apply the principles of connectivity, security, sustainability, and community where these added considerations are traded-off in process of negotiated design. The mix of interacting physical, economic, and social considerations produces a collective form of cumulative impacts. These changes that we make affect both the place we inhabit and the quality of our lives.

We illustrated these principles in a collection of ten Midwestern communities that demonstrate the viability of civic armatures. Using a particular analytical drawing technique, we separated the towns into their substructure, infrastructure, and superstructure. We then recombined these separate elements to include only those pieces of each that contributed to a commonwealth. This produced a drawing of the central organizing spines of public commonwealth, the civic armatures, that each of these ten communities is built on.

We create these armatures by combining expanded development choices into *ensembles* of buildings and spaces into a superstructure that adds meaning to a place, *settings* informed by the substructure, and *armatures* of connected activities, spaces, and places in order to organize our communities into a collective form -- a commonwealth of shared interests and public connections.

E.6. Benefits: The model ~~standards~~ guidelines will provide local public officials and legislators the information generated by this study about viable, environmentally sensitive alternative ~~stand~~ guidelines in a form which will facilitate adoption. The repor 'll provide the

rationale and supporting documentation to establish the ~~environmental and public health, safety, welfare bases~~ basis for alternative ~~standards~~ guidelines .

IV. EVALUATION

For the FY92-93 biennium the project can be evaluated by its ability to: (1) identify and measure environmental impacts attributable to local subdivision development standards; (2) identify and adapt, for Minnesota use, alternative standards which offer potential to avoid or reduce impacts; (3) identify reductions and avoidance of adverse environmental effects through the use of alternative standards which accommodate health, safety, welfare concerns; (4) provide a defensible rationale and supporting evidence for the adoption of alternative - standards by Minnesota cities.

In the long-term, evaluation of this project's success will be the extent to which its findings and model - standards are actually adopted and applied in the context of local residential subdivision control in Minnesota cities. While the products of this project will be in a form readily usable by professional planners on the staff of local cities and towns, a formal program for the transfer of the information and monitoring of adoption of the models generated are beyond its scope and funding. The transfer and adoption of the knowledge developed in this project would be a logical and necessary project which would need to occur subsequent to this project, for reasons of logical sequence, time and budget.

V. CONTEXT: RELATED CURRENT AND PREVIOUS WORK

A. The landmark decision handed down by the U.S. Supreme Court in Nollan v. California Coastal Commission (1987) underscored the need for local development controls to be firmly based on sound environmental premises and clearly linked to the protection of public health, safety and welfare. The two decades previous to this decision saw the creation of several new federal, state and local policies aimed at achieving a range of environmental objectives. In housing development, these objectives were pursued by layering specific remedial requirements on top of existing local residential subdivision - standards, leaving the basic requirements essentially unchanged. In many cases, required - standards are in direct conflict with environmental objectives. For example, many local - standards require excessive amounts of paved area which maximizes runoff, flooding and water quality degradation at great expense. The same - standards then require more expense for ponding to mitigate these impacts. The fact that the required ponding in at least one third of the areas actually increases downstream flooding is ignored in such blanket regulations. Such situations provide great opportunity for avoiding impacts by rethinking the basics, (not to mention great exposure to litigation if such rethinking does not occur).

No holistic, comprehensive examination of the environmental effects of typical land development - standards has been done in Minnesota. Nationally, several studies and demonstration projects have shown that many environmentally sensitive alternatives exist which cause far less environmental damage than the rigidly prescriptive housing development standards typically in use in Minnesota cities today.

B. This project will make relevant to Minnesota work done by Federal agencies, other state agencies and local governments outside Minnesota relative to more environmentally sensitive local - standards. For example, U.S. Department of Energy studies on energy saving site planning and design complete through the Argonne National Laboratory specifically recommended that its findings be further studied and adapted for application by region (this has not been done in Minnesota). Most of this work is narrowly focused on single envir ntal issues. This project will specifically select, expand and grate the

standards developed in this body of work to address a broad spectrum of environmental objectives.

C. The LCMR has not specifically funded work in this area in the past. This project will, however, build upon the LCMR funded work by the MPCA that resulted in the publication *Protecting Water Quality in Urban Areas*. It will specifically build on the work on site planning and water quality presented in Section 3.1 of that publication, which was prepared by Prof. Robert Sykes, one of the principal investigators of this project.

Past accomplishments without LCMR funding have been done largely, but not exclusively, outside of Minnesota, with single environmental objectives as their focus, as described in B, above. Such work has provided a strong base for this project, without which it would be far more costly and time consuming.

For the next biennium, it would be logical to for LCMR to consider funding an education program aimed at local public officials and decision makers to facilitate the adoption and use of the results of this project. This project is aimed at the largest consumer of new suburban land, residential land uses. Further environmental savings could be realized if similar projects aimed at the next largest land use categories in new suburbs, industrial and commercial, were also funded.

D. Not applicable

E. Biennial Budget System Program Title and Budget: Not available at this time.

VI. QUALIFICATIONS

A. Program Manager

Michael Robinson
Lecturer, College of Architecture and Landscape Architecture, University of Minnesota

Master of Landscape Architecture in Urban Design, Harvard University, 1977
Critic in Urban Design, Harvard University, 1978 - 1982.
Visiting Scholar in Urban Design, University of Minnesota, 1990 - 1992

Michael Robinson is a licensed architect with substantial professional experience in architecture, landscape architecture, and urban design. He has authored several papers, booklets, and publications concerning residential community planning. He is currently working on *The American Neighborhood Atlas*, a compendium of planned residential communities in America from 1850 to 1930. *The American Neighborhood Atlas* is funded by the National Endowment for the Arts. His primary responsibilities as program manager will be to oversee environmental impact assessment tasks for both status quo and alternative standards (Objectives A and D), the design of one case study site using alternative - standards (Objective C), and the preparation of the final report (Objective E).

B. Major Cooperators

Robert D. Sykes
Associate Professor, Department of Landscape Architecture, University of Minnesota

Master of Landscape Architecture, Harvard University, 1979
Bachelor of Landscape Architecture, University of Minnesota, 1973

Prof. Sykes is a licensed landscape architect with substantial professional experience in the planning and design of housing subdivisions in Minnesota, Maine, New Hampshire, Virginia, and Massachusetts. He is currently Vice-Chair of the American Society of Landscape Architects Committee on Housing. He has authored several papers and book chapters on stormwater management and design - standards in residential development. He wrote the chapter on site planning for the guidebook *Protecting Water Quality in Urban Areas*, recently published by the Minnesota Pollution Control Agency. Prof. Sykes has also had *extensive experience in environmental impact assessment.* He has professionally prepared environmental impact statements and studies for several projects, including electric power transmission lines and national wildlife refuges, as well as commercial, industrial and housing projects. Prof. Sykes' primary responsibilities will be as project manager and to oversee environmental impact assessment tasks for both status quo and alternative - standards (Objectives A and D), the design of one case study site using alternative - standards (Objective C), and the preparation of the final report (Objective E).

VII. REPORTING REQUIREMENTS

Semi-annual status reports will be submitted not later than Jan. 1, 1992, July 1, 1992, Jan. 1, 1993, and a final status report by July 1, 1993.

1991 RESEARCH PROJECT ABSTRACT
FOR THE PERIOD ENDING JUNE 30, 1993
This project was supported by the Legislative Commission on Minnesota Resources (LCMR)

TITLE:	Model Residential Land Use Guidelines - Land 18
PROGRAM MANAGER:	Michael Robinson
ORGANIZATION:	University of Minnesota, Dept. of Landscape Architecture
LEGAL CITATION:	M.L. 91, Ch. 254, Art. 1, Sec. 14, Subd. 10 (h)
APPROP. AMOUNT:	$150,000

STATEMENT OF OBJECTIVES
To survey the typical residential subdivision design regulations for Minnesota to examine their cumulative environmental, social, and economic effects, in order to explore alternative design guidelines that may have a more beneficial and environmentally sound result and to produce a set of model design guidelines, based on alternative choices, for developing cities to apply to future development.

RESULTS
The subdivision design regulations, PUD regulations, overlay zoning districts, and engineering standards from seventeen developing communities were compared. The design regulations from all seventeen cities were nearly identical, regardless of the wide variety in environmental context or community needs. The regulations call for the proper "sizing" of utility corridors, roadways, easements, streets, and lots; not because these dimensions will make the best place to live, but because these regulations reflect the values of utility efficiency, traffic safety, and efficient real estate transactions. These same regulations are applied throughout the Twin Cities area despite tremendous physical landscape differences, creating a homogeneous and physically and socially unstable residential land development pattern. However, substituting a new set of dimensional design standards for the existing ones would not begin to address the necessary considerations for building socially, economically, and environmentally sustainable communities that reach beyond utilitarian function, and reflect the values of their citizens: the creation, protection, and conservation of the environmental, social, and cultural resources necessary to build a community. We identified the physical building blocks of successful communities through a search for United States planned communities from 1850 to 1930 in hundreds of professional journals and books. We applied these to current and future Minnesota land development, and developed a new set of design principles that call for the inclusion of considerations and choices that shift development decisions from functional "sizing" to making a physical world of collective unity that allows communities and neighborhoods to develop.

PROJECT RESULTS USE AND DISSEMINATION
This project has been presented to the Urban Land Institute National Conference in May, 1993, and to the Minnesota Builders Association in April, 1993, by Michael Robinson, who, along with Paul Damon, will be presenting this project at the Council of Educators in Landscape Architecture national conference in Eugene, Oregon on October 16-20, 1993. A presentation of this project at the Sensible Land Use Coalition conference in Bloomington, Minnesota in March 1993 was given by Paul Damon. We have also met on five occasions with our review committee members from the Metropolitan Council, city planners, engineers, fire chiefs, watershed managers, landscape architects, and area development firms for "hands-on" discussion groups. Products: Robinson, Michael, Robert D. Sykes, Paul Damon, and Mary DeLaittre, *Final Status Report* submitted to LCMR. Robinson, Michael, Paul Damon, Kalpana Kuttaiah, and Heidi Johnson, *United States Planned Community Report 1850 - 1930.* A compendium of 600 articles covering planned community development with a related planned community photographic slide collection and bibliography. Robinson, Michael, Robert D. Sykes, Robert Gunderson, Joni Giese, and Jian Wei Li, *Case Study Technical Report.* Robinson, Michael, Robert D. Sykes, Patrick Condon, Paul Damon, Mary Jackson, and Barbara Hanson, *Status Quo Development Regulations Report.*

JULY 1, 1993
LCMR FINAL STATUS REPORT - SUMMARY - RESEARCH

I. MODEL RESIDENTIAL LAND USE GUIDELINES - LAND 18

Program Manager: Michael Robinson
Department of Landscape Architecture
125 Architecture Building, University of Minnesota
89 Church St. S.E.
Minneapolis, MN 55455
612 - 626 - 8286

A. M.L. 91, Ch. 254, Art. 1, Sec. 14, Subd. 10 (h)

Model Residential Land Use Guidelines: This appropriation is to the University of Minnesota, Department of Landscape Architecture, to illustrate and disseminate residential land development guidelines that address a broad range of environmental concerns. The work must be done in consultation with the Metropolitan Council. The legislative commission on Minnesota resources may convene a steering committee to ensure coordination and practical results.

Budget:

a. Amount Budgeted (LCMR) $150,000

b. Balance: $0

B. Not applicable.

C. Not applicable.

II. NARRATIVE

A. Statement of Problem: Local subdivision standards direct the physical arrangement of housing on the land (i.e. the dimensions and arrangement of houses, lots, and streets and required infrastructure) through the subdivision design and platting process. Studies in the areas of energy, storm water management, water quality, and housing affordability have identified that many of these standards for new housing mandated by local subdivision regulations can cause significant and costly environmental damage. These impacts tend to be directly and indirectly the result of blanket subdivision requirements which cannot be adequately varied to meet site-scale variances in natural environmental factors such as soil, topography, and vegetation community.

The incidence and degree of such impacts are to a large extent due to the spatial relationships made manifest in the subdivision layout, utility and grading schemes as a result of the influence of subdivision regulations. For example, the relationship of required pavement areas and their micro-scale positioning relative to runoff flow paths and receiving waters is critical to water quality concerns for non-point source pollution. The widths of the pavements are explicitly specified and their lengths and positioning is implicitly specified in local zoning and subdivision regulations. Taken together, they promote certain pavement patterns and exclude others. From a water quality standpoint, the pavement and runoff management patterns typically designed into new subdivisions tend to create problems rather than prevent them. In Minnesota, many local subdivision controls exclude the use of more

environmentally sound development patterns that have been devised in other regions to avoid impacts.

This project contributes to the remedy of this situation by : (1) Identifying and quantifying the environmental costs attributable to the subdivision design patterns resulting from typical Minnesota residential land development standards so their significance can be understood; (2) Identifying, adapting and codifying for use in Minnesota, appropriate and tested environmentally sensitive alternatives to these standards that provide practical, defensible options for local public officials and legislators. The transfer and adoption of the knowledge developed in this project would be a logical and necessary project which would need to occur, for reasons of logical sequence, time and budget, subsequent to this project.

It is important to understand that this project proposes to assess only those impacts generated by the regulatory requirements of local subdivision controls which influence the design and layout of physical relationships of elements in new subdivisions, and not the state and federal level controls which are designed to monitor and mitigate environmental effects of new subdivisions. Also, this project does not intend to quantify and tabulate the aggregate future environmental effects of all subdivision development in Minnesota. Instead its focus is upon assessing the relative differences between status quo and alternative approaches to subdivision development controls in generating adverse environmental effects.

B. Importance: This year, new non-point source water pollution elimination regulations will be implemented by the U.S. Environmental Protection Agency, that will require a rethinking of all urban land design conventions to meet national water quality objectives. Authority for achieving environmental objectives in new housing developments is segmented among several Federal, State, county and local regulators making it difficult for any one authority to propose comprehensive solutions. Although the need for change is recognized by several local planning officials, none has the budgetary capacity and interjurisdictional perspective to develop comprehensive alternative models.

C. Extent of the Problem: Residential subdivision standards affect over 60% of newly developed Minnesota land -- five times more land than the next most land consumptive use: industrial. In many categories, environmental impact is directly related to the amount of land area affected. The economic cost of mitigating the avoidable environmental damage caused by such standards has had tremendous impacts on the social and economic environment. These costs have helped drive the home lot portion of new home prices from 15% of the total in 1950 to 35% today, pricing 9 out of 10 people in their prime family building years out of the home-buying market.

III. OBJECTIVES

A. Assess Environmental Impacts of Status Quo Land Development Standards

A.1. Narrative: This objective is to clearly identify the status quo of land development standards in new suburban areas, and then measure the impacts attributable to those standards. Because impacts tend to compound when individual standards are combined in their application to design whole subdivisions, the environmental cost of maintaining the status quo in land development standards must also be examined in that context. For this reason, the impacts will be assessed through the use of actual projects which reflect status quo standards. The specific impact issue areas examined will focus on environmental objectives embodied in published policies affecting Minnesota communities which are affected by the spatial controls applied in regulating the subdividing process. These include but are not

limited to: stormwater runoff, downstream flooding, non-point source water quality, ground water recharge, energy consumption, wildlife habitat, urban forests, soil erosion, neighborhood aesthetics and the cost of the land component of new housing.

A.2 Procedures:

(a) Gather and analyze existing subdivision regulations and zoning codes which control the physical form of new subdivisions from a representative sample of Twin Cities Metropolitan Area suburban cities.

(b) Develop a representative set of status quo standards. These will be developed from the information gathered in task (a) and will cover all facets of the physical design of subdivisions (e.g. -- minimum setbacks, road widths, storm sewer requirements, lot sizes, permissibility of natural drainage and cluster development, etc.).

(c) Review and criticize the representative set of status quo standards. Reviewers will include Metropolitan Council staff, as well as local public officials, developers and consulting professionals who provide subdivision design services.

(d) Revise the set of status quo standards as needed to correct discrepancies and errors identified in (c).

(e) Identify and document the health, safety, welfare rationale for each individual status quo standard using both library research and structured commentary solicited from the Metropolitan Council staff and other reviewers used in (c).

(f) Select ~~at least two completed plans~~ for Case Study #1 a completed plan for actual market-rate housing subdivisions which closely reflect the applications of the typical standards developed in tasks "c" and "d" and obtain permission to use ~~them as case studies in this study~~ it as a case study. By using completed plans for actual subdivisions, the project will be able to use the environmental impact assessment information already developed for each project, realizing a great saving in data gathering and impact analysis costs for both the site and the development program. For Case Study #2, select an undeveloped site in an emerging community and design a new subdivision according to the status quo standards.

(g) Using the two case studies, identify, quantify and catalog the environmental impacts of construction, use and maintenance attributable the status quo standards. Because of the generic focus of this study, this task will be limited to the use of readily available data from standard sources, and data already gathered for the actual case study sites.

Another important limitation is that this impact analysis will focus on those impacts which arise from the physical site design pattern dictated and promoted by the status quo standards. This means that the focus of the impact analysis will be on physical changes which have spatial implications, measurable in terms of length, area, volume, character of surfaces, and relative position of elements. For example, runoff discharges and volumes can be developed using the S.C.S. TR-55 method from measurements of different site surfaces and their configuration in plan. In another example, energy consumption related to site configuration can be measured in terms of the embodied energy required to create and maintain surfaces (energy costs per unit area to produce and maintain paved surfaces can be directly applied to surface quantities measured from plans).

In all cases the development program -- the number of dwelling units per site -- will be assumed to be constant, eliminating the need to explore differences in impacts on social and political issues in depth, especially with respect to government social services needed to support the new development. Economic impacts relative to cost of physical development and housing affordability will be measured assessing the cost of site

improvements against household income profiles obtained from census data. In the case studies, actual development costs could be used instead of estimates. Aesthetic impacts will be assessed using expert evaluation rather than visual quality assessment survey techniques, and will draw heavily upon landscape architectural and urban design literature as well as behavioral literature regarding proxemics and spatial affordances.

(h) PRODUCT: Draft report documenting the results of (g) and the work upon which it relies.

A.3. Budget:

a.	Amount Budgeted (LCMR)	$43,000
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the value of the work done for this task is considerably greater than that reflected by the amount shown above. Based upon fees charged for comparable studies which have been conducted in other regions of the U.S. by professional landscape architectural consultants, the above amount would have to be multiplied by a factor of 2.0 to 2.5 to yield a comparable market rate fee.

A.4. Timeline for Products/Tasks:

	July 91	Jan. 92	July 92	Jan. 93	June 93
(a) Inventory existing regulations	••••••				
(b) Analyze regulations and develop status quo standards	•••				
(c) Review and verify status quo standards	•••				
(d) Revise status quo standards	••••				
(e) Obtain case study subdivisions	•••				
(f) Identify health, safety, welfare rationales for status quo standards	••••••••			XXXXXXXXXX	
(g) Assess environmental impacts of applied status quo standards		••••••••••••		XXXXXXXXXX	
(h) Draft report			••••••••••••		XXXXXXXXXX

A.5. Status:

The development ordinances for seventeen third ring developing suburbs of the Twin Cities were inventoried and compared. This inventory included subdivision design standards, zoning codes, PUD ordinances, zoning overlay districts, and engineering standards. These standards were arranged in a matrix to allow a comparison among the seventeen cities' development regulations.

Together, these standards describe only the placing of utilities within given dimensional corridors; the width of street rights-of-way according to amounts of anticipated daily traffic, the width of utility corridors on front, side, and rear lot lines, the minimum and maximum lot length and width, the various setback requirements for different building types, and the arrangement, size, and maximum lengths of lot arrangements. Having accomplished the appropriate "sizing" of lots, cul-de-sac bulbs, street rights-of-way, utility easements, and setbacks, the regulatory requirements for the design of our cities have been satisfied. One is left with a highly serviced pad to build a shelter on; we call this "making a utility pad," but no connection to a larger community setting. In the end, we can only speculate that these

standards have become traditional within the planning and engineering professions because they have not been substantially challenged.

We chose two case study sites, both completed market rate subdivisions, located across an existing arterial roadway from each other in Plymouth, Minnesota.

We measured the physical changes and environmental costs in the case study site by comparing the completed development, built to status quo regulatory standards, to the site's pre-development condition. From the map information provided by both the city and the development engineering firm for the subdivisions, we measured the following changes: impervious soil cover (sq. ft.), pervious soil loss (total cut - total fill) in cubic feet, annual pollutant loading (lb.), total soil cut (c.y.), total soil fill (c.y.), vegetation by area (sq. ft.) and length of perimeter (linear ft.), the critical vegetative buffer zones both in area (sq. ft.) and perimeter (linear ft.), both the eliminated and disturbed natural drainage ways (linear ft.), the total area changed by cut and fill (sq. ft.), and the total amount of land dedicated to public open space (sq. ft.).

We found an expected increase in disturbance after development, along with a loss of natural stormwater drainage ways, which resulted in an increase in the amount of stormwater runoff; we found an increase in impervious surfaces (streets, driveways, and roofs), an increase in annual pollutant loading, and a net loss of vegetation, and pervious soil.

The existing regulations only describe the size, placement, and design of individual utilities, roads, and parcels, and the environmental changes can only be considered cumulatively. Thus, the assessment made it clear that a new way had to be found to change the cumulative physical structure of a subdivision from an assembly of isolated individual utility pads whose physical structure keeps people apart; to a physical structure that brings people together by building a commonwealth, a public domain of shared interests, a common-unity or community.

A.6. Benefits: Assessment of the environmental costs attributable to locally mandated standards for new subdivisions will provide valuable information about the environmental effects of maintaining the status quo by regulatory authority. Currently this cost is virtually unrecognized and unmeasured in Minnesota communities. The ability to understand how and why these standards were developed will assist communities in understanding how to trade-of the status quo standards for other considerations such as environmental, community building, diversity, and affordable housing issues.

B. Identify And Adapt Proven Development Standards Which Can Eliminate Conflicts And Avoid Impacts Identified In Objective A.

B.1. Narrative: A critical aspect of any environmental assessment is the evaluation of alternatives. Environmentally sensitive alternatives to the status quo standards identified in Objective A have been developed and applied in other regions of the U.S., (such as *Performance Streets*, a street design policy developed by Bucks county Pennsylvania). However, most are narrowly focused and have been developed in the context of specific issues, such as street network design, stormwater management, energy, and affordable housing. This objective seeks, selects and interprets environmentally sensitive alternatives, for use across the full spectrum of environmental objectives, adapting them for use in Minnesota's climate and landform conditions.

B.2 Procedures:

(a) Using literature and existing applications, identify social, economic, and environmentally sensitive alternatives to status quo standards which offer potential to avoid or greatly reduce the impacts identified in Objective A, yet still meet the identified health, safety, welfare goals.

(b) Identify, catalog and quantify the environmental impacts of construction and continued use and maintenance attributable the environmentally sensitive alternatives. This would involve basically the same work as in A.2(g). Again, the impact analysis will focus on the effect of physical changes which have spatial implications (measurable in terms of length, area, volume, character of surfaces, and relative position of elements) on relevant environmental issues. At this level a general comparison with status quo standards would be applied, attempting to identify the most promising alternatives in terms of potential flexibility gains and potential reductions of lengths, areas volumes, and proportions of types of surfaces in ways that would yield improvements in overall performance.

(c) Review and criticize the environmentally sensitive standards. Reviewers will include Metropolitan Council staff, as well as local public officials, developers and consulting professionals.

(d) Revise and refine alternatives as needed to correct problems identified by review and comment.

(e) PRODUCT: Identify and illustrate comprehensive strategies for using alternative standards in the context of the case study subdivisions. These strategies will be primarily physical design strategies which influence the design and layout of housing subdivisions. Special emphasis will be placed upon aspects related to length, area, volume, character of surfaces, and relative position of elements, which are normally controlled by zoning regulations and subdivision standards.

(f) PRODUCT: Draft report of findings to guide and direct Objective C.

B.3. Budget:

a.	Amount Budgeted (LCMR)	$31,320
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the market value of the work done for this task is 2.0 to 2.5 times greater than that reflected by the amount shown above. (See A.3 for further explanation).

B.4. Timeline for Products/Tasks:

	July 91	Jan. 92	July 92	Jan. 93	June 93
(a) Identify environmentally sensitive ~~alternative standards~~ guidelines			•••••	xxxxxxxx	
(b) Evaluate and illustrate alternative ~~standards~~ guidelines			••••••••	xxxxxxx	
(c) Review alternatives			••••		
(d) Revise, refine and codify alternatives			••••		
(e) Identify and illustrate comprehensive strategies for using alternative ~~standards~~ guidelines			•••••		xxxxxx
(f) Draft report to guide and direct Objective C			•••••		xxxxxx

B.5. Status:

We examined the designs of approximately 250 planned communities and cities in the United States to find alternative physical design choices to the status quo standards. We found these planned residential communities in a search of over 800 journals, books, articles, pamphlets, and brochures printed from 1850 to the present. We compiled a computer database of the planned communities, and built a related photographic slide collection of over 1200 slides illustrating these communities. We used the compendium of articles, books, and slides to evaluate these communities in terms of their potential to avoid or reduce the physical, environmental, social, and economic impacts we had identified in Objective A.

We developed alternative principles by analyzing the historical examples of successful community building gleaned from library research and our data base of 224 planned communities. The resulting alternative principles of development include an assessment of the features that exist in the place where development is contemplated; landscape features of the physical terrain: hills, bluffs, ravines, lakes, rivers, forests, prairies, fields, etc.; as well as civic features such as public buildings and squares, institutions, parks and parkways; and sacred places such as cemeteries, Native American cultural resources, churches, etc. Once these resources have been assessed, the community must ask themselves "what kind of place do we want to make?" The community must decide what approach it will take: whether to *preserve* in entirety a given resource, or whether to *conserve* it in some other fashion; whether to *restore* a resource or to *mitigate* potential ongoing damage, or whether to *reclaim* a resource from a fallen state. Once these decisions have been made, a series of development choices can be negotiated. We proposed an expanded set of choices that cities, developers, and communities can use to build the type of places they envision: variable lot sizes and frontages, a new street hierarchy based on humanistic principles instead of functional traffic types, varied street and right-of-way widths, street events, civic easements for walkways and plantings, and the collective placement of residential housing with the service- and place-enriching features that are necessary for any neighborhood or community to emerge.

B.6. Benefits: The identification and interpretation of environmentally sensitive alternative ~~standards~~ guidelines for use in Minnesota will provide decision-makers a context for comparison in understanding and evaluating the acceptability of the environmental costs associated with maintaining the status quo ~~-standards~~. The presentation of the planned residential communities in America that have been developed since 1853 will provide a unique source of proven development patterns that communities can turn to in evaluating which status quo standards are appropriate and which may need to be modified due to the inclusion of other considerations.

C. Model The Integrated Application Of The Results Of Objective B On Case Study Sites.

C.1. Narrative: The same processes used to determine the environmental costs status quo ~~standards~~ guidelines will be applied to the environmentally sensitive alternative ~~-standards~~ guidelines. As explained in Objective A, they must be evaluated in the context of practical application on the case study sites. This objective is to prepare alternative plans for the case study sites so that the combined effects of the environmentally sensitive ~~-standards~~ alternative guidelines in applied situations can be identified and measured for comparison with the status quo effects.

C.2 Procedures: Prepare alternative design schemes for subdivisions on each of the two case study sites using the ~~codified~~ alternative ~~-standards~~ guidelines and the strategies developed in Objective B. To maintain an objective basis for comparison, the number and type of dwelling units used in the status quo plans will be maintained, and standard landscape architectural site planning and design techniques will be applied. Schemes will be detailed to a sufficient level to permit environmental impacts to identified, catalogued and quantified. Case study designs using alternative ~~-standards~~ guidelines will be periodically reviewed with Metropolitan Council staff and other outside experts, as in Objectives A and B, to assure quality and accuracy. Products will include drawings (e.g. plans, sections, etc.) and outline specifications for alternative schemes in sufficient detail to permit an assessment of impacts in Objective D parallel to that conducted in Objective A.

C.3. Budget:

a.	Amount Budgeted (LCMR)	$33,100
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the market value of the work done for this task is 2.0 to 2.5 times greater than that reflected by the amount shown above. (See A.3 for further explanation).

C.4. Timeline for Products/Tasks:

	July 91	Jan. 92	July 92	Jan. 93	June 93
(a) PRODUCT: Prepare plan for case study A			•••••xxxxxxxx		
(b) PRODUCT: Prepare plan for case study B			•••••	xxxxxxxxxx	

NOTE: Since the work on each of the two case study sites is primarily design work typical to standard professional landscape architectural schematic design, it may be conducted independent of the other site. There are no critical interdependencies inherent in the work which would affect project scheduling. Thus, scheduling becomes a matter of staffing. It is planned that a different designer would be assigned to each project, permitting the tandem prosecution of each task. The tasking and procedures for each case are identical in terms of the description provided under C.2 above.

C.5. Status:

We redesigned the two case study sites in accordance with the new guidelines we developed in Objective B. The new guidelines emphasize the success of private wealth as directly related to the quality of our commonwealth. The private wealth of homes, retail and commercial properties, and corporate offices is built upon the commonwealth -- the substructure of the land itself, its resources and capabilities; the infrastructure of the public streets and ways, and the superstructure of the anchoring institutions, landmarks, and places that support the social and economic structures of any human settlement. The physical form of communities has obeyed timeless principles for thousands of years; it is only is the last century that the values of urban form shift from making a community to making a commodity. These historical examples have clearly demonstrated that the long term value of private wealth is based on the relative quality of the commonwealth -- it is impossible to make private wealth without it.

We developed the following guidelines, derived from our study of hundreds of precedent communities, as the principles which have historically been applied to build a strong commonwealth. They are: connectivity, security, sustainability, and community.

Connectivity refers to being connected. Connectivity means that the streets connect one place or activity to another, it means that the streets are not dividing strips of traffic conduit, but are

connecting civic public spaces, capable of supporting the social and functional necessities of a neighborhood and community.

Security encompasses more than just safety. The status quo standards are full of regulations designed to increase traffic safety. Although the status quo street standards may have made our streets more *safe*, they have not made our communities more *secure*.. A recent article in the local newspaper described a ride-along conversation between a journalist and a convicted burglar. The burglar preferred to work in the suburbs, he said, because there is less traffic, because everything is further apart, and because neighbors don't watch out for each other's property.

Sustainability is more than just environmental or physical sustainability; it includes the social and economic welfare of our communities. It is the support of the long-term viability of the community.

Community, or *common-unity*, emerges from a shared interest in inhabiting a place. We don't inhabit sites, we inhabit places, regions, communities, and towns. Common unity develops from connected, secure, sustainable places, where citizens may have diverse values, but they have a shared interest in common ownership, in inhabiting the same place, and in making a sustainable community.

C.6. Benefits: Plans which demonstrate the application of the environmentally sensitive alternative ~~standards~~ community development guidelines identified and developed in Objective B will provide the essential base needed to assess the combined effects of the alternatives. They will also provide important examples of what the housing developments shaped by these alternatives will look like -- always a fundamental question in the acceptance of any new idea for shaping the environment. In addition, the community development guidelines will outline a process by which communities can make the necessary trade-offs between health, safety, and welfare status-quo standards and other considerations which will build viable and sustainable neighborhoods. These neighborhoods in turn build the larger community of cities and towns in the developing sectors of the metropolitan area and in growing counties and townships in the State of Minnesota.

D. Assess Environmental Impacts of Alternative ~~Land~~ Community Development ~~Standards~~ Guidelines

D.1. Narrative: This objective is to measure the impacts attributable to the environmentally sensitive alternative ~~land~~ community development ~~standards~~ guidelines identified in Objective B and demonstrated in Objective C. This will be conducted in same manner as the assessment of impacts generated by the status quo standards described in A.2(g).

D.2 Procedures:

(a) Identify, catalogue and quantify the environmental impacts of construction, use and maintenance attributable the environmentally sensitive alternative ~~standards~~ guidelines in terms of the effects of individual ~~standards~~ design and planning choices. This would provide for a general comparison of the differences in impact levels between status quo ~~standards~~ and alternative models. Specific impact issue areas examined will include: stormwater runoff, flooding, non-point source water quality, ground water recharge, embodied energy, wildlife habitat, urban forests, soil erosion, neighborhood aesthetics and cost of the land component of housing.

(b) Identify, catalogue and quantify the environmental impacts of construction, use and maintenance attributable the environmentally sensitive alternative ~~standards~~ community development guidelines in terms of their combined effects identified in the context of the case study subdivisions.

(c) Review findings with Metropolitan Council staff and outside reviewers for criticism and comment.

D.3. Budget:

a.	Amount Budgeted (LCMR)	$17,800
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the market value of the work done for this task is 2.0 to 2.5 times greater than that reflected by the amount shown above. (See A.3 for further explanation).

D 4. Timeline for Products/Tasks:

	July 91	Jan. 92	July 92	Jan. 93	June 93
(a) Assess impacts of individual alternative ~~standards~~ guidelines			•••••	XXXXXXX	
(b) Assess combined effects of alternative ~~standards~~ guidelines			••••••••	XXXXXXX	
(c) Review findings with review panel			•••	XXXXX	
(d) PRODUCT: Draft report of findings			••	XXXX	

NOTE: The work represented by the above tasks is essentially the same as that identified in A.2(g) and reflected in A.4(g). Some time savings are planned to be recognized in the mensuration and tabulation of lengths areas and volumes of impacts by developing designs under Objective C using computer aided design systems which automate such task to a much higher level than that anticipated for the similar work done on the actual case study plans in A.2(g).

D.5. Status:

We identified, catalogued and compared the environmental impacts of an existing status quo development, with a development designed with the alternative guidelines we developed in Objective B and applied to our case study site in Objective C. For the purposes of comparison, the two developments are labeled "status quo" -- the development that was actually built in accordance with existing status quo standards; and "proposed" -- the development using our proposed alternative guidelines.

The comparison is quite clear: the "proposed" development of alternative guidelines disturbed only twenty-two percent of the site compared to fifty-one percent of the status quo; the pervious soil loss dropped sixty-nine percent with the alternative development; the total area of vegetation increased by thirty-nine percent; and the total amount of cut and fill decreased by fifty-six percent.

The environmental impacts are considerably lower using the alternative "proposed" development guidelines. However, we wanted to measure more than just the environmental impacts -- they can be quantified individually, but the cumulative effects can't be quantified except by examining how they are applied in total. So we measured the amount of land that was dedicated to our commonwealth -- the things that are capable of binding people to a

physical place. The alternative development contained thirty-three percent more land dedicated to a commonwealth (772,313 sq. ft. proposed compared to 579,003 sq. ft. status quo) than the status quo development. This translates into an increase of land in which the residents have a shared interest; an increase from thirty-six percent to forty-nine percent in public land, and a decrease from sixty-four percent to fifty-one percent in privately held land. The commonwealth of the proposed development is composed of public recreation areas (463,513 sq. ft.), institutions (a branch library and a school -- 128,700 sq. ft.), commercial properties (68, 750 sq. ft.), and the space of a civic street, scenic easements, and a civic armature (39,150 sq. ft.). The commonwealth of the status quo development is comprised only of park land (516,900 sq. ft.), and residential street rights-of-way (62,103 sq. ft.).

We reviewed these results with Metropolitan Council staff, developers, and planners. The response was overwhelmingly positive, not only in the research review meetings, but also in the public presentations of this material to national conferences of the Urban Land Institute, the Minnesota Builders Association, and the Sensible Land Use Coalition.

D.6. Benefits: Assessment of the adverse environmental effects attributable to environmentally sensitive alternative ~~standards~~ guidelines for new subdivisions will provide valuable information needed to compare the cost of maintaining the status quo by regulatory authority with the cost of pursuing alternative approaches. Comparisons conducted in other regions, based upon single environmental issues, suggest that substantial adverse environmental effects will be avoided or greatly reduced, at lower economic costs, through use of environmentally sensitive alternative ~~standards~~ guidelines . The new guidelines will also try to illustrate that we can also build sustainable communities if we begin to consider other issues such as community development, diversity, and affordable housing, to name just a few. Learning to proactively plan for neighborhoods in our developing suburban and exurban cities, towns, and townships, rather than creating transactionally and economically efficient subdivisions, will help emerging communities build a strong place-based economy, a stable social fabric, and a memorable place to inhabit.

E. Prepare Final Report and Model ~~Standards~~ Guidelines for Community Development.

E.1. Narrative: A pilot study conducted by the project manager identified that many Twin Cities Metropolitan Area planning officials and design consultants need alternatives to the status quo standards which have been adapted to Minnesota, and codified for ready application, together with supporting documentation. This objective will be to prepare a final report comparing and contrasting status quo approach with alternative ~~standards~~ guidelines and an annotated model standard with commentary to facilitate use by Minnesota cities.

E.2 Procedures:

(a) Prepare draft model subdivision ~~standard~~ guidelines annotated with specific supporting references and illustrations and guiding commentary needed to facilitate adoption in the context of existing regulatory structures.

(b) Review draft with Metropolitan Council staff and outside reviewers for criticism and comment.

(c) PRODUCT: Revise model subdivision ~~standard~~ guidelines as needed to respond to the results of task (b).

(d) PRODUCT: Prepare final report documenting all the findings of this study.

E.3. Budget:

a.	Amount Budgeted (LCMR)	$24,980
b.	Balance:	$0

NOTE: Because the University of Minnesota is not permitted to charge overhead to the LCMR, the market value of the work done for this task is 2.0 to 2.5 times greater than that reflected by the amount shown above. (See A.3 for further explanation)

E 4. Timeline for Products/Tasks: July 91 Jan. 92 July 92 Jan. 93 June 93

(a) Prepare model ~~standard~~ guidelines •••••••••
(b) Review model ~~standard~~ guidelines •••••
(c) PRODUCT: Revise and finalize model ~~standard~~ guidelines as needed •••••
(d) PRODUCT: Prepare final report ••••••••••••••••••

E.5. Status:

This is the major conclusion of the study: how does it all add up, and how can we make trade-offs and mitigate the cumulative impacts of development? These questions are more important than pursuing each impact individually. This conclusion has been agreed upon by every review committee meeting that we held. The Metropolitan Council members, city administrators, mayors and council members, developers, designers, and planners all agree that how we greatly expand the range of choices in the process is more important than the individual system impacts. We have to redefine public health, safety, and welfare to include the additional vital considerations of connectivity, security, sustainability, and community. We propose these four considerations as essential principles or guidelines based on timeless ways of building communities.

We illustrated these principles in a collection of ten Midwestern communities to demonstrate the viability of civic armatures. Using a particular analytical drawing technique, we separated the towns into their substructure, infrastructure, and superstructure. We then recombined these separate elements to include only those pieces of each that contributed to a commonwealth. This produced a drawing of the central organizing spines of public commonwealth, the civic armatures, that each of these ten communities is built on.

We create these armatures by combining expanded development choices into *ensembles* of buildings and spaces into a superstructure that adds meaning to a place, *settings* informed by the substructure, and *armatures* of connected activities, spaces, and places in order to organize our communities into a collective form -- a commonwealth of shared interests and public connections.

E.6. Benefits: The model ~~standards~~ guidelines will provide local public officials and legislators the information generated by this study about viable, environmentally sensitive alternative ~~standards~~ guidelines in a form which will facilitate adoption. The report will provide the rationale and supporting documentation to establish the ~~environmental and public health, safety, welfare~~ bases basis for alternative ~~standards~~ guidelines .

IV. EVALUATION

For the FY92-93 biennium the project can be evaluated by its ability to: (1) identify and measure environme impacts attributable to local subdivision development standa (2) identify and

adapt, for Minnesota use, alternative standards which offer potential to avoid or reduce impacts; (3) identify reductions and avoidance of adverse environmental effects through the use of alternative standards which accommodate health, safety, welfare concerns; (4) provide a defensible rationale and supporting evidence for the adoption of alternative - standards by Minnesota cities.

In the long-term, evaluation of this project's success will be the extent to which its findings and model - standards are actually adopted and applied in the context of local residential subdivision control in Minnesota cities. While the products of this project will be in a form readily usable by professional planners on the staff of local cities and towns, a formal program for the transfer of the information and monitoring of adoption of the models generated are beyond its scope and funding. The transfer and adoption of the knowledge developed in this project would be a logical and necessary project which would need to occur subsequent to this project, for reasons of logical sequence, time and budget.

V. CONTEXT: RELATED CURRENT AND PREVIOUS WORK

A. The landmark decision handed down by the U.S. Supreme Court in Nollan v. California Coastal Commission (1987) underscored the need for local development controls to be firmly based on sound environmental premises and clearly linked to the protection of public health, safety and welfare. The two decades previous to this decision saw the creation of several new federal, state and local policies aimed at achieving a range of environmental objectives. In housing development, these objectives were pursued by layering specific remedial requirements on top of existing local residential subdivision - standards, leaving the basic requirements essentially unchanged. In many cases, required - standards are in direct conflict with environmental objectives. For example, many local - standards require excessive amounts of paved area which maximizes runoff, flooding and water quality degradation at great expense. The same - standards then require more expense for ponding to mitigate these impacts. The fact that the required ponding in at least one third of the areas actually increases downstream flooding is ignored in such blanket regulations. Such situations provide great opportunity for avoiding impacts by rethinking the basics, (not to mention great exposure to litigation if such rethinking does not occur).

No holistic, comprehensive examination of the environmental effects of typical land development - standards has been done in Minnesota. Nationally, several studies and demonstration projects have shown that many environmentally sensitive alternatives exist which cause far less environmental damage than the rigidly prescriptive housing development standards typically in use in Minnesota cities today.

B. This project will make relevant to Minnesota work done by Federal agencies, other state agencies and local governments outside Minnesota relative to more environmentally sensitive local - standards. For example, U.S. Department of Energy studies on energy saving site planning and design complete through the Argonne National Laboratory specifically recommended that its findings be further studied and adapted for application by region (this has not been done in Minnesota). Most of this work is narrowly focused on single environmental issues. This project will specifically select, expand and integrate the standards developed in this body of work to address a broad spectrum of environmental objectives.

C. The LCMR has not specifically funded work in this area in the past. This project will, however, build upon the LCMR funded work by the MPCA that resulted in the publication *Protecting Water Quality in Urban Areas*. It will specifically build on the work on site

planning and water quality presented in Section 3.1 of that publication, which was prepared by Prof. Robert Sykes, one of the principal investigators of this project.

Past accomplishments without LCMR funding have been done largely, but not exclusively, outside of Minnesota, with single environmental objectives as their focus, as described in B, above. Such work has provided a strong base for this project, without which it would be far more costly and time consuming.

For the next biennium, it would be logical to for LCMR to consider funding an education program aimed at local public officials and decision makers to facilitate the adoption and use of the results of this project. This project is aimed at the largest consumer of new suburban land, residential land uses. Further environmental savings could be realized if similar projects aimed at the next largest land use categories in new suburbs, industrial and commercial, were also funded.

D. Not applicable

E. Biennial Budget System Program Title and Budget: Not available at this time.

VI. QUALIFICATIONS

A. Program Manager

Michael Robinson
Lecturer, College of Architecture and Landscape Architecture, University of Minnesota

Master of Landscape Architecture in Urban Design, Harvard University, 1977
Critic in Urban Design, Harvard University, 1978 - 1982.
Visiting Scholar in Urban Design, University of Minnesota, 1990 - 1992

Michael Robinson is a licensed architect with substantial professional experience in architecture, landscape architecture, and urban design. He has authored several papers, booklets, and publications concerning residential community planning. He is currently working on *The American Neighborhood Atlas*, a compendium of planned residential communities in America from 1850 to 1930. *The American Neighborhood Atlas* is funded by the National Endowment for the Arts. His primary responsibilities as program manager will be to oversee environmental impact assessment tasks for both status quo and alternative standards (Objectives A and D), the design of one case study site using alternative - standards (Objective C), and the preparation of the final report (Objective E).

B. Major Cooperators

Robert D. Sykes
Associate Professor, Department of Landscape Architecture, University of Minnesota

Master of Landscape Architecture, Harvard University, 1979
Bachelor of Landscape Architecture, University of Minnesota, 1973

Prof. Sykes is a licensed landscape architect with substantial professional experience in the planning and design of housing subdivisions in Minnesota, Maine, New Hampshire, Virginia, and Massachusetts. He is currently Vice-Chair of the American Society of

Landscape Architects Committee on Housing. He has authored several papers and book chapters on stormwater management and design - standards in residential development. He wrote the chapter on site planning for the guidebook *Protecting Water Quality in Urban Areas*, recently published by the Minnesota Pollution Control Agency. Prof. Sykes has also had *extensive experience in environmental impact assessment.* He has professionally prepared environmental impact statements and studies for several projects, including electric power transmission lines and national wildlife refuges, as well as commercial, industrial and housing projects. Prof. Sykes' primary responsibilities will be as project manager and to oversee environmental impact assessment tasks for both status quo and alternative - standards (Objectives A and D), the design of one case study site using alternative - standards (Objective C), and the preparation of the final report (Objective E).

VII. REPORTING REQUIREMENTS

Semi-annual status reports will be submitted not later than Jan. 1, 1992, July 1, 1992, Jan. 1, 1993, and a final status report by July 1, 1993.