Implementation
Implementation Tools

The City has a number of tools at its disposal to shape development patterns, protect natural and human infrastructure, and protect the quality of life for residents. Implementation strategies can be separated into several distinct 'tool' categories. Each tool has distinct characteristics suitable for specific goals and circumstances. The tools available to the City that comprise the City's implementation portfolio include:

- *Education and Promotion* – Formal programs or informal efforts undertaken by the City or in conjunction with the City to encourage voluntary actions by individuals or businesses that help fulfill the City's desired future conditions as described in this Comprehensive Plan.

- *Incentives and Incentive Regulation* – Inducements offered by the City or in conjunction with the City to elicit actions by individuals or businesses that move the City toward its desired future conditions. The inducements or incentives may include:
  - Direct financial assistance such as cost sharing
  - Indirect financial assistance such as tax breaks or infrastructure improvements
  - Regulatory incentives such as density bonuses or flexible regulatory options
  - Professional assistance incentives such as technical assistance in façade or infrastructure design, integration of historic elements, or meeting State or Federal regulatory standards

- *City Ordinances and Other Regulation* – City ordinances, including zoning, subdivision, environmental, etc., as well as the administrative approvals process. Regulation includes:
  - Threshold standards such as minimum or maximum lot sizes, height requirements, natural resource functional values, etc.
  - Performance standards that regulate development impacts such as erosion
  - Administrative standards such as information or analyses required for a development
  - Application and the order and timing of approvals by regulating authorities

Comprehensive Plan Goal
The City will consider historical context of the area or neighborhood in public projects or in evaluating developments where the City is a financial partner and will use design, materials and detailing consistent with the surrounding character (Policy P&P 13).

Strategies
Education and Promotion – Inventory historic resources and promote the results of the inventory to educate citizens and visitors on Duluth's varied and valuable historic assets.

Incentives and Incentive Regulation – Create regulatory incentives such as façade improvement grants, tax deferments, transferable development credits, or design assistance with building code issues.

Ordinances and Other Regulation – Create form-based standards for areas that are characterized by historic buildings and traditional building forms

Managing Public Processes and Resources – Adopt context-sensitive flexibility in street design standards to enhance historic character.

- *Managing Public Resources, Lands and Processes* – Public investments and management decisions for infrastructure, public services, public lands, and public processes. Such investment or decisions may include:
  - Capital improvements planning coordination between departments to meet Comprehensive Plan goals
  - Water, wastewater, and transportation investments made by the City or ultimately managed by the City
  - Land acquisition, sale, or exchange for the purpose of preservation or development
  - Economically viable management decisions and expenditures for public resources such as streets, parks and property management, and deployment of public services
  - Enhancing or modifying the Comprehensive Plan or supporting documents based on new information from studies, decisions, etc.

Rarely will a single tool or category of tools be sufficient to achieve Comprehensive Plan goals. Most policies, and preferred mix of land uses shown on the future land use map, require the use of several tools from different categories in order to be realized and sustained. The City must take a 'portfolio' approach in its implementation choices, recognizing that each category of tools has unique strengths and weaknesses.

The accompanying text boxes, showing a Plan goal and possible strategies, describe how a variety of strategies can work toward a single goal.

Implementation of the Comprehensive Plan is discussed in three sections: 1) land use strategies, 2) transportation strategies, and 3) public facilities and capital improvements. The land use section presents the strategies needed to implement the Comprehensive Plan's land use policies and goals. The transportation implementation and the public facilities and capital improvements sections follow.

The three strategy sections present an inter-related framework for achieving the future condition represented by the future land use map and the policies. The following strategy recommendations do not represent the only possible strategy options available.

The strategies are organized as follows:

- Land Use Regulation
- Development Review Process
- Staging of Infrastructure and Services
- Environmental and Resource Management
- Public Realm Improvements and City Investments
- Comprehensive Plan Enhancements

These categories draw on a variety of tools discussed above. The primary focus of the first three categories is on incentives, and regulation, and development review processes. The remaining categories include the full range of implementation tools.

Land use regulation

The primary recommendation of this section is to re-write the City's zoning ordinance. While that effort will require more thorough analysis and more detailed recommendations than those presented here, the following general strategies should be pursued as part of the process:

- A form-based code approach where appropriate

Comprehensive Plan Goal
Meeting the mixed use development goals in the three master planning areas identified on the future land use map (U.S. Steel site, western port area, antennae/tower farm area);

Strategies
Education and Promotion – Create and promote conceptual development concepts for redevelopment areas to remove some of the uncertainty facing developers.

Incentives and Incentive Regulation – Use tax increment financing (TIF), interest write-downs, tax-free zones, selective co-funding, or similar economic development incentives targeted to high-priority redevelopment sites on the future land use map such as the master-planned sites.

Ordinances and Other Regulation – Create a master plan for redevelopment sites and codify the preferred mix of uses and preferred site and building design in the applicable zoning district(s), using form-based standards.

Managing Public Resources, Lands and Processes –Make proactive infrastructure improvements (streets, sewer, water, improvements or consolidation of public open space) to encourage private investments in underused, blighted, or contaminated commercial and industrial areas.

- Introduction of mixed use in many locations
- Conservation design to protect natural resources and open space networks
- Overlay districts for resource and view protection
- Specific districts or standards for large institutions and large redevelopment projects
- Regulatory priority given to some economic resources
- Site plan review for the majority of development projects

Zoning ordinance

The central component of land use regulation is the zoning ordinance. Duluth's zoning ordinance dates back to 1958, with continuing amendments and revisions up to the present. It reveals its evolution in its organization, and in the different standards and review procedures that apply to individual zoning districts.

The existing zoning ordinance has 'base districts' that are Suburban through R-4 residential districts, the C-1 through C-4 commercial districts, and the M1, M-2 and W-2 industrial and port districts. These districts contain minimal plan review requirements, no design standards (except for those that were later added for specific uses such as townhouses) and are 'pyramidal' in nature – that is, each successive district within each category contains all the permitted uses in the preceding (less intense) districts. This type of "Euclidean" zoning is now considered seriously outdated and ineffective.

By contrast, the newer districts such as the Medical Center and Planned Commercial districts, have more detailed and specific standards for uses and activities. For example, the Downtown Waterfront Mixed Use-Design Review District is, as the name implies, a highly specific district with detailed design standards and a design review process with a technical advisory committee. While these individual districts set high standards in certain areas, the ordinance as a whole is obsolete and has been amended so many times that it lacks internal consistency, making it very difficult to use for development review.

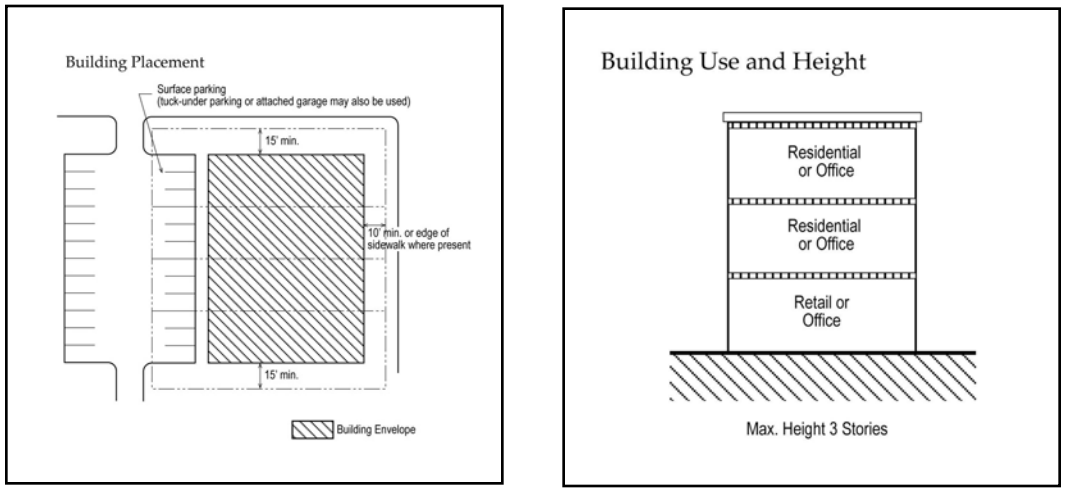
Form-based code

Consistent with the Plan's governing principles, the City is prepared to develop a form-based zoning code for some of the higher density mixed use areas, such as the downtown, East Hillside, and Lincoln Park. Form-based regulation is an outgrowth of an increasing awareness that the concept of 'place' is of vital importance to sustaining cities over time (see definition in sidebar). The governing principles speak directly to the importance of enhancing sense of place, creating synergies through a mix of land uses, and building the concept of form into land use regulation. Similarly, the future land use map is explicitly based on a mixed use concept and recognizes the importance of building form in all land use categories.

Typical form-based codes include the following features:

- *Coding by district and/or by street* - Some codes link building types to street types so that, for example, storefront-type mixed use buildings are located along collector streets but not local streets. Others use a district-based approach similar to conventional zoning, or combine both aspects.

- *Highly graphic* - Aspects such as building height, building footprint, parking location, and even uses on different floors can all be shown graphically, making the requirements easier to visualize. Graphics cannot, however, replace all text.



Examples of form-based code graphics for a mixed-use building

Form–based code

A form-based code is a regulatory tool that places primary emphasis on the physical form of the built environment with the end goal of producing a specific type of "place."

Conventional zoning strictly controls land-use, through abstract regulatory statistics, which can result in very different physical environments. The base principle of form-based coding is that design is more important than use. Simple and clear graphic prescriptions for building height, how a building is placed on site, and building elements (such as location of windows, doors, etc) are used to control development. Land-use is not ignored, but regulated using broad parameters that can respond to market economics, while also prohibiting undesirable uses.

Source: City of Farmers Branch, Texas,
www.ci.farmers-branch.tx.us/Planning/codes7FAQs.html

Regulating code (form-based code)

Develop a form-based code to replace the outdated zoning ordinance. The form-based code should encourage development that is consistent with the downtown's historic character and pedestrian scale, while allowing for more intensive, urban, mixed-use development in appropriate locations per the urban analysis, master plan, and urban design proposals produced during the charrette. The code should define and protect the character of the distinct neighborhoods, corridors, and districts identified within the study area, which vary in terms of the intensity, height, and mix of development. The code should specify the residential, commercial, and mixed-use building types permitted; the types of frontages permitted; the siting of buildings on lots; the location of parking to the side and rear of buildings, in parking courts in the interior of blocks, and in structured parking lined with habitable space for housing, retail, and office along the perimeter of parking lots and structures; and set a minimum standard for screening and tree planting for parking lots.

Recommendation From Community Building Strategies, in *The Town Paper, Duluth Post-Charrette Edition*, Spring 2006

- *Focus on streetscape* - As buildings are defined, so are streets – the building frontage and the street combine to produce a public place. Therefore, street cross-sections and other design standards may be included in the code.

- *Uses* - Form-based codes do not ignore land use, but rather regulate it in a more flexible manner designed to encourage mixed use at many scales and locations.

Where are form-based codes appropriate?

Because the form-based code is carefully calibrated to existing conditions, the coding process is a detailed one, involving analysis of all the elements of a district or corridor – built form, streetscape, parking and land use. The process can be time-consuming and expensive. Most form-based codes developed to date have focused on specific corridors or districts, rather than an entire city. Many codes are developed in conjunction with a master plan or specific area plan for a district or corridor. In Duluth, a sample code for the Lower Chester Creek corridor was developed as a follow-up to the 2005 Knight Charrette plan. Form-based codes may also be used in some larger redevelopment areas, such as the U.S. Steel site, and some residential areas with unique historic elements such as Morgan Park.

Strategies for incorporating form-base code concepts into the City's revised zoning ordinance include the following:

Form codes 1. Develop form-based standards for specific districts and corridors where higher intensities, a diversity of uses, or a more pedestrian-oriented environment are desired. These include:

A. Central Business Primary and Secondary areas.

B. Urban Residential areas in and around Duluth's downtown and East Hillside, in keeping with the charrette recommendations.

C. Commercial corridors such as London Road between 10th and 26th Avenues or the Grand Avenue business district. These two areas, and seven others, are identified for further future study on the future land use map (see Comprehensive Plan Enhancement subsection). The studies can shed considerable light whether and how form-based codes could be created.

D. East Hillside neighborhood, as described in the 2005 Knight Charrette recommendations.

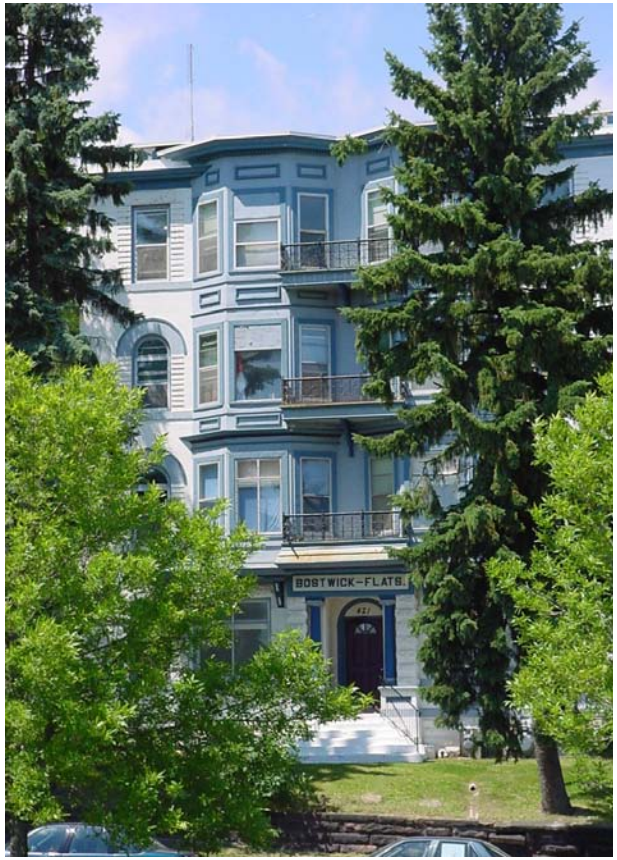
E. Large redevelopment sites, in conjunction with master plans for those areas. Three areas are identified on the future land use map as needing master planning.

Form codes 2. Develop form-based standards for historic districts and resources, incorporating results of historic resource inventories, and allowing for some flexibility to accommodate adaptive reuse of historic buildings. These areas include:

A. Historic districts where detailed standards for infill and renovation are appropriate, particularly those areas designed for future study (on the future land use map) and noted as having historic resources (on the historic resource overlay map).

B. Areas that are characterized by historic buildings and traditional building forms (i.e., the Cenral Business District Core and Fringe, Grand Avenue Business District, etc.).

C. Historic buildings, such as the Armory, where private investment should be encouraged.



Form codes 3. Develop form-based standards to accommodate the mix of uses and range of densities needed to support Duluth's medical institutions:

A. Identify expansion areas for medical facilities on the zoning map.

B. Set flexible form standards, including height standards, for the medical district that protect viewsheds in areas uphill of the medical district.

C. Identify parking and transportation strategies that restrict parking as a stand-alone land use.

D. Set form standards for neighborhood transitions between medical and commercial, residential, and mixed use areas.

Form codes 4. Develop form-based elements that are more general in nature In many other parts of the city; For example, certain preferred building types might be encouraged along certain street types.

Form codes 5. Incentive programs can work to enhance form-based codes just as with traditional use-based codes. Consider creating a design assistance center within the City or supported by the City to provide technical assistance for developers in creating master plans and site plans that are consistent with the City's plans and regulations.

Mixed use

Many of the land use categories on the future land use map are intended to combine, rather than separate, compatible uses. These include the Primary and Secondary downtown areas, Neighborhood Mixed-Use nodes, and most commercial corridors. Even residential categories are intended to include small-scale retail, institutional, or office uses where appropriate. This encouragement of combined rather than segregated land uses can be achieved in several ways:

- Form-based coding standards (as described above) can control elements such as ground floor and upper story uses and building frontage (how the building meets the street).
- Introduce standards for compatibility between specific uses or buffering between less-compatible uses (i.e., industrial and residential) as part of the zoning rewrite.
- Develop master plans for large redevelopment sites, as described above and in the upcoming Comprehensive Plan Enhancement strategy section.

Specific regulatory strategies to meet the Comprehensive Plan's mixed use policies include the following:

Mixed use 1. Create mixed use synergies to support commercial investment:

A. Encourage a housing density, in both Urban Residential and Traditional Neighborhoods, at the higher end of the preferred density range near targeted commercial nodes.

B. Create density incentives or regulatory flexibility for infill around existing Neighborhood Commercial nodes, including Lakeside-Lester, Woodland, Commonwealth Avenue in Gary-New Duluth, and Central Entrance.

Mixed use 2. Allow low-intensity commercial land uses in residential neighborhoods, if designed with attention to context and subject to performance standards.

A. Land use regulation should acknowledge the mixed use nature of most neighborhoods, while retaining the primary protection for the preferred land use as designated on the future land use map.

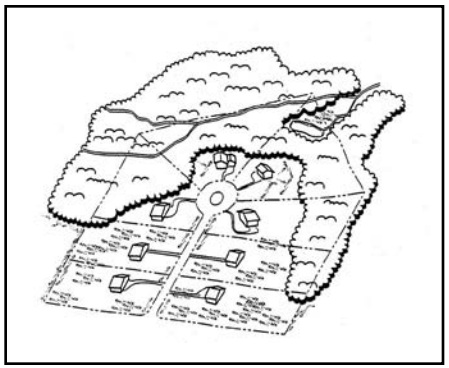
B. Identify mixed land use areas that allow for higher residential densities with commercial land uses and vertical mixed use buildings.

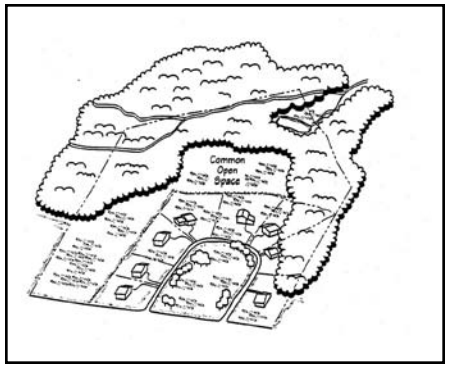
Mixed use 3. Create model design templates that demonstrate mixed use and form preferences for priority redevelopment areas in order to reduce uncertainty about regulatory approvals.

Conservation design

The City will require conservation design for privately-owned properties that fall within the Sensitive Lands Overlay, in whole or in part, and encourage conservation design throughout the City. Conservation design, one form of which is called 'cluster development,' is a technique for open space and natural resource preservation on a parcel-by-parcel basis. In a conservation subdivision, houses are clustered on relatively small lots, while the remainder of the site is protected as open space. Essentially, conservation subdivision concentrates allowed density on the most suitable portions of a site, while protecting sensitive natural features and, in some cases, productive farmland. Advantages of conservation subdivision include:

- Greater design flexibility in siting houses and other development features such as roads and utilities. Frequently the length of roads and utility runs can be reduced, and the amount of site clearance minimized.
- Preserving scenic views and reducing the visual impact of new development by maintaining landscaped buffer areas along roads.
- Providing housing units with direct visual and physical access to common open space.
- Creating environmental corridors by connecting open space between adjacent properties.
- Allowing for continuation of forestry or agricultural uses, where these can be adequately buffered from nearby residential uses.





Conventional development, above, consumes the entire parcel with house lots, while conservation design, below, protects natural features and provides residents with common recreational areas.

- Allowing active and passive recreational use of common open space by residents and/or the public.

Protected open space in a conservation subdivision is typically placed under a conservation easement, to ensure that it remains undeveloped. It can be managed by a homeowners' association, land trust or by a government agency.

Conservation design **1.** The City will develop conservation design standards for zoning districts within the Sensitive Lands Overlay and include the following elements:

A. Inventory and assessment of natural and scenic features on each site prior to development (consistent with the Natural Resource Assessment and future land use map), so that site design can respond to these features. Site design examples include vegetative management appropriate to on-site or adjacent resources, stormwater management that protects streams and adjacent properties, setbacks and buffers consistent with established natural resource management standards.

B. Performance standards that allow some flexibility for mitigating risk to scenic and natural features (as identified in the site inventory).

C. Consolidation of permitted development (housing units or nonresidential floor area) outside of sensitive natural areas on the site, or conditionally within some natural areas if performance standards are met that will remove the impact to sensitive resources.

D. Requirements for how much open space must be preserved in projects requiring subdivision approval, guided by the future land use map categories. As a general guideline, Rural Residential areas should have 50% open space not including protected wetland and shoreland areas, while higher density categories will have progressively smaller requirements.

E. Standards that group housing units in coherent and interconnected neighborhoods with adequate visual and physical access to open space. As a general guideline, neighborhood clusters should be limited in size and oriented toward a natural feature or amenity such as

a greenway, a park, parkway with median, wetland, woodlands, etc.

F. Design connections between open space on adjacent parcels, to provide continuity of habitat corridors and other interconnected resources.

Conservation design

2. Create a portfolio of strategies for managing Duluth's green infrastructure to mitigate existing stormwater and water quality problems in conjunction with the existing stormwater rules.

A. Implement the City of Duluth's Stormwater Management Goals and Policies (June 2005).

B. Set impervious surface standards for subdivision review and for plan approvals for existing built lots,

C. Offer performance standard alternatives for stormwater management and consider transferable stormwater mitigation to focus resources on the most critical areas within a watershed. (Work with Duluth's Stormwater Utility to identify the critical areas within each watershed).

D. Consider incentives such as tax breaks for reducing and disconnecting impervious surfaces in impacted watersheds or at places where predevelopment runoff is already a problem,

E. Work with the Northland NEMO program and the Regional Stormwater protection Team to provide educational programs and materials that encourage landowners to protect water quality.

Conservation design

3. Allow the use of innovative conservation building and site design elements:

A. Develop building standards that allow and encourage incorporating 'green roofs' into building designs to improve stormwater management and reduce energy usage,

B. Set performance standards for use of recycled or reused building materials

C. Allow the use of solar technologies, with appropriate design stan-

dards, in all areas of the city, and identify appropriate areas and standards for use of on-site wind energy and other renewable energy technologies,

D. Create standards to allow the use of rain gardens, engineered swales, and other stormwater infiltration techniques instead of conventional ponding and conveyance.

Overlay districts

Viewshed and historic resource protection has been identified as an important policy. Viewsheds and historic landscapes are clearly imbued with Duluth's unique character and sense of place, across most of the city's hillside and lakeshore areas, particularly along the Skyline Parkway corridor. Viewshed policies can be incorporated into zoning codes both through form-based standards and viewshed protection overlay districts. A view protection overlay would incorporate review of visual impacts into the development review process (see discussion below) and could establish controls such as maximum heights and building widths along specific view corridors.

Viewsheds 1. The City will adopt viewshed protection techniques such as the following:

A. Tree retention on development sites.

B. Identifying and maintaining prominent rock faces, bluffs and historic stone-built walls and bridges, to provide for a strong presentation of Duluth's urban and natural lakefront qualities.

C. Creating a standard GIS-based tool for viewshed analysis to minimize development uncertainty.

D. Siting of higher buildings at the lowest elevation within the primary downtown district and medical district, so that hillside viewsheds of adjacent land uses are not affected.

E. Limiting encroachment into the Avenue viewsheds, while enhancing the viewshed through strategic stepping back of tall buildings in redevelopment projects within the historic grid.

Viewsheds 2. Develop a viewshed protection overlay on lands within the 200- to 300-foot buffer on either side of Skyline Parkway. Underlying land uses would

likely remain the same, while provisions could include:

A. A review process to assess impacts of new development on viewsheds.

B. Limitations on building width as a percentage of lot width, and building height, (depending on what is allowed by the underlying zoning).

C. Incentives such as additional height or floor area to encourage design that protects viewsheds and retains/enhances existing vegetation. Note the issue of vegetation management is one of the most controversial in this and other scenic corridors, since vegetation can either obscure or soften and enhance views from above and below, depending on one's perspective. Case-by-case solutions may be required.

Historic buildings and landscapes are, like Duluth's viewsheds, imbued with the community's sense of place. The proposed form-based codes and historic resource inventory (described elsewhere) are the primary means through which historic buildings can be integrated into development and redevelopment efforts. The following additional steps should be incorporated into the City's regulations and incentive programs.

Historic 1. Set standards that encourage adaptive reuse in order to capture the tourism value of historic commercial structures.

A. Create flexible restoration and reuse standards for historic structures or buildings eligible for historic designation.

B. Promote and encourage interpretation of historic structures or buildings in order to increase public awareness of and education about Duluth's rich commercial /industrial past.

Historic 2. Adopt preservation and restoration standards for locally-designated historic buildings.

A. Standards should be consistent with the Secretary of Interior's Standards for Rehabilitation.

B. Flexibility in building uses, densities, coverage or similar incentives should be considered to encourage compliance and minimize redevelopment costs.

Development tiers and staging

A primary tenet of this Comprehensive Plan is the 'no-regrets' strategy that first sets aside the City's green infrastructure when designating preferred development patterns. The future land use map designates the City's most critical green infrastructure for preservation. At the same time, the map designates large areas of currently undeveloped land within City boundaries for some level of development. The staging of this development is critical for two reasons: 1) to ensure that the City's green infrastructure is protected through efficient and resource-sensitive development patterns; and 2) to minimize the cost to the City of road and utility extensions and emergency services that new greenfield development often requires. Thus, the staging policy is one of the essential elements of this plan, in conjunction with the future land use map and other policies.

Staging districts will guide the designation of zoning districts on the zoning map, the development review process, and the City's own public improvements and expansions. The following staging districts, or similar staging concepts, should be addressed in the City's new zoning and subdivision ordinances or unified development code.

Tier 1: Neighborhood infill and extensions, generally within the historic street grid, well-served by streets and utilities: the fewest limitations; a streamlined approval process. May include reduced parking standards along transit corridors, and waiving of park dedication requirements where existing access to open space is sufficient.

Tier 1 also includes large-scale redevelopment of priority sites – brownfield sites, port sites, downtown commercial properties and institutional sites. Master plans may be required (may involve City assistance) which may involve a charrette or similar public involvement process. May include reduced parking standards, waiver of certain other requirements, or direct public assistance with infrastructure, site assembly, etc.

Tier 2: New neighborhoods or commercial centers that can be served fairly easily by street or utility extensions that will not unduly burden the existing infrastructure or emergency response systems and includes a regular approval process and developer(s) must bear cost of all utility extensions and street improvements, including those necessary to alleviate any traffic problems. City will maintain infrastructure post development.

Tier 3: New neighborhoods or commercial/industrial development that will require extensive street or utility extensions and will place burdens on emergency services, includes a special (conditional) approval process and developers may be required to maintain infrastructure post development.

Rural residential: Rural development beyond utility networks and some (defined) distance from existing streets. Essentially a rural zone – where City street maintenance may be waived and assigned as a homeowner responsibility for on-site utilities. Emergency services would probably need to be provided, but with longer response times. School busing might be provided from the nearest collector street. Special approval process requires review by City departments, acceptance of these conditions, and homeowner notification.

Staging considerations can be incorporated into the zoning ordinance, subdivision ordinances and/or unified development code in several ways:

Stag·ing. (staj'ing) v.tr. To arrange and carry out: stage an invasion.
Source: The American Heritage Dictionary

Staging 1. Limit development opportunities in Tiers II and III until staging criteria are met, through the following or similar means:

A. Apply large lot zoning districts in areas not ready for infrastructure expansion, while ensuring that large lot development patterns can accommodate infill as urban staging expands.

B. Consider rural (20-40 acre lot size) and exurban (3-10 acre lot size) in all Rural Residential zones, with density bonuses if cluster standards are met.

C. Re-evaluate development tiers every 5 years, or in response to changing conditions, to assess whether tiered areas should be changed to a different level.

Staging 2. Use a Land Evaluation Suitability Analysis (LESA) program to guide staging of development:

A. Create standards for desired access to public infrastructure capacity, including water and wastewater systems, distance from public roads, and the capability of the City to provide emergency services.

B. Identify natural resource standards that are linked to the City's Natural Resource Assessment to keep undeveloped land in relatively contiguous blocks.

C. Use the LESA analysis to guide responses to re-zoning requests and to proactively up-zone areas as they become ready for the next stage of development according to identified indicators.

Staging 3. Protect undeveloped or lightly developed land from inappropriate 'leap-frog' development:

A. Identify staging thresholds that could trigger rezoning opportunities or public infrastructure investments.

B. Limit public infrastructure extensions in areas disconnected from existing development.

C. Use large lot zoning districts in areas not meeting staging thresholds.

D. Set development standards for building placement and road development that allow for future connectivity and logical subdivision for areas not yet meeting staging thresholds.

Staging 4. Create an adequate public facilities standard for greenfield development:

A. Consider a minimum net density standard (after removing green space and natural areas) in the subdivision ordinance to justify utility extensions or capacity enhancements.

B. Use levels of service standards for water, wastewater, roads, and access to schools to guide decisions on re-zoning applications.

C. Evaluate the cost of extending emergency services to greenfield areas.

Staging 5. Stage zoning for Large Scale Commercial (LSC) areas:

A. Reserve some existing low intensity areas around regional commercial areas for future expansion, buffers between neighborhoods and Large Scale Commercial areas, and green infrastructure.

B. Create incentives, such as density bonuses, shared parking requirements, or other regulatory flexibility, to encourage re-development of older 'big box' or strip commercial facilities within the Large Scale Commercial areas and Central Business Secondary areas.

Staging considerations are also closely related to public infrastructure management. The Capital Improvements and Public Facilities section identifies areas where particular infrastructure investments or limitations will need to be considered in order to meet the Comprehensive Plan staging goals. Generally, however, the priority public investment areas are described in the following strategy:

Staging 6. Set priorities for supporting development and re-development efforts with infrastructure expansion or extensions. Develop criteria for comparing sites. Highest priorities include the following:

A. Vacant or underutilized industrial areas such as the U.S. Steel, Cement Plant, and Clyde Iron sites.

B. Underutilized waterfront and general industrial areas in the port area.

C. Commercial properties in the Primary and Secondary Central Business areas.

D. Re-development sites for more higher density housing and mixed use development within the Higher Education Overlay, Secondary Central Business, and Urban Residential areas adjacent to downtown.

E. Expansion or re-development of the airpark and industrial park area.

F. Neighborhood extensions where infrastructure capacity (utilities, roads, green infrastructure) is readily available.

Large institutions

The City will develop specific zoning standards and districts applicable to institutions on large sites, or those that attract large user populations. Requirements will include on-going master planning, in collaboration with the City and affected neighborhoods, so that institutional expansion plans are recognized and coordinated with City neighborhood or corridor plans and public improvement projects.

The use of transitional standards along the borders between large institutions and adjacent neighborhoods should be considered as well. Transitional standards might require building heights to 'step down' to adjacent building heights, additional landscaping, or street improvements consistent with neighborhood or corridor plans.

Institutions 1. Work with institutions of higher education on planned expansions to provide supporting services and private investment in a coherent, planned manner:

A. Restrict land uses that are not appropriate for traditional neighborhoods.

B. Set performance standards for secondary land uses that minimize nuisances to the primary land use.

Institutions 2. Cooperate in master planning processes with institutions, large corporate entities, and governmental entities with responsibilities for land use and large facilities planning:

A. Identify assistance (infrastructure expansion, road improvements or management) by which the City can support institutional expansion.

B. Identify common goals of the institution and City.

C. Address the cumulative impacts of the expansion and the changes needed in land use regulation, and infrastructure to prevent impacts.

D. Identify opportunities for institutional improvements to contribute to the public realm and sustain the City's natural and social assets.

E. Identify areas for new housing investment and associated transportation or infrastructure improvements.

F. Create a cooperative planning process with the School District to take advantage of land use synergies such as between residential neighborhoods and school locations.

Institutions 3. Create a separate institutional district within the zoning ordinance rather than including large institutions as an allowed or conditional use in other zones.

A. Recognize the synergy between residential land uses and schools by limiting review of proposed school sites in residential districts to transportation impacts.

B. Plan cooperatively for transitions of institutional land ownership from public to private hands to maximize value consistent with the future land use map.

Other development regulations

In addition to the zoning ordinance re-write, Duluth's other development regulations should be evaluated and revised or re-written in light of the Plan policies. These include the subdivision ordinance (used when new lots are subdivided), the building code, street standards, and regulations for grading, stormwater management and erosion control. Regulations should be evaluated in light of the policies of the Plan, and in relation to the new zoning ordinance.

Development review and approval

Duluth's development review and approval process needs to be streamlined in order to efficiently move development that is consistent with the Comprehensive Plan through the approval process. The development review and approval process also needs to offer clear opportunities for proposals to be modified in order to meet Plan policies and goals. An inefficient, confusing, or ad hoc process could be a major obstacle to the Plan's re-development and development goals. The review and approvals process should include the following elements:

- A pre-development concept meeting with city staff from all departments
- A formal policy or procedure for development review by staff from various city departments
- Clear threshold decision points, such as a formal letter or memo prepared for applicants or the Planning Commission outlining the city's position, staff recommendations, or issues of concern after a conceptual review
- A formal processes for re-zonings that safeguards the public's interest in site design, building form or appearance, and issues such as view preservation and natural resurce protection
- Requirements for a development agreement or contract that will preclude changes in design or site plan after re-zoning.
- A time frame requirement for project construction and completion after regulatory approvals.

One component of the development approval process is site plan review: the detailed review of development plans for compliance with the requirements of the zoning ordinance and other regulations. Most cities use site plan review routinely, often dividing it into minor (administrative) and major (Planning Commission) review processes. Review criteria can include, in addition to regulatory thresholds, the policies and design standards established by comprehensive plans or area plans.

The newer districts in Duluth's zoning ordinance call for site plan review, but without a consistent set of standards or procedures, while the older districts have no such requirements. The zoning ordinance re-write should establish city-wide standards and procedures for site plan review, applicable to developments with any nonresidential, mixed use or higher-density housing components, as well as projects within viewshed or other resource protection areas.

In addition to the above development review standards, several alternative development review and approval concepts should be considered:

Development review 1. Clear integration of site plan review into the zoning ordinance. This gives the City a standard tool for reviewing all major development proposals in an objective manner. Going a step farther and integrating the development review process into a unified

development code that integrates subdivision or replatting approvals, design review, and building permit could streamline the approval process and reduce risk of unsatisfactory results.

Development review **2.** A charrette-based alternative to traditional design and review. Standards for when such a process is appropriate, and how it should be conducted, should include:

A. A pre-application meeting with city staff (i.e. planning, engineering, fire, etc.) where the applicant presents a concept/sketch plan.

B. A formal review of the concept by city staff, outlining issues of concern in regard to code compliance and consistency with the Comprehensive Plan,

C. Staff and planning commission confirmation of the development site as one that is appropriate for charrette-based review.

D. A public charrette that meets performance standards for neighborhood and other stakeholder participation, to create design, intensity, and to address issues of staff, planning commission, and neighborhood concern.

E. Limited, expedited final review by staff and the planning commission that recognizes the value of the charrette process, but ensures that the project meets other City requirements.

Natural resources

Many of the Comprehensive Plan policies address environmental and natural resource management. In order to sustainably manage the City's green infrastructure, protection of natural resource functions must be considered in regulation and development review and through the use of other implementation tools such as incentives and promotional programs.

Some of the environmental and natural resource management policies will be implemented through regulatory changes to the City's ordinances. Examples include:

Natural resource mgmt **1.** Develop performance standards, as part of the zoning ordinance, for those areas covered by the Sensitive Lands Overlay.

Natural resource mgmt **2.** Incorporate Low Impact Development (LID) standards into new development ordinances:

A. Create standards for impervious surfaces, wetland protection, and vegetative management geared toward the sensitivity of the watershed.

B. Create performance standards for protection and management of defined natural resources covered by the SLO. Defined natural resources may include specific functional categories:

i. Watershed function for water quality, flood control, and habitat protection or enhancement.

ii. Wetland functions and stream headwaters.

iii. High value ecosystems or rare or unusual plant or animal communities as described by Duluth's Natural Area Program (DNAP).

iv. Critical connectivity areas, as identified in the Natural Resource Assessment.

C. Consider opportunities to use the development and re-development process to create regional or area-wide stormwater management best management practices for areas larger than proposed development sites.

Natural resource mgmt **3.** Codify the Natural Resource Assessment (or some form of it) as the standard for identifying ecologically significant areas in the development review process.

A. Create a natural resource studies process similar to commercial corridor or transportation project studies to guide development in areas that meet or are approaching staging thresholds and update the Sensitive Lands Overlay as warranted.

B. Periodically consider opportunities to modify the preferred land use designations, to protect green infrastructure not currently designated

for preservation on the future land use map, or to allow sensitive development to occur in areas currently designated for preservation.

C. Develop tools to use the Natural Resource Assessment information to evaluate development impacts and guide both development and site plan review.

D. Periodically update the Natural Resource Assessment to help the City recognize and incorporate better data, new connectivity priorities, and address Duluth's evolving watershed and water quality issues.

E. Conduct a functional value assessment of the City's wetlands and woodlands.

Natural resource mgmt **4.** Update the shoreland, floodplain, and water resource management ordinances and integrate with the new zoning ordinance.

Environmental and resource management goals can also be achieved using incentive tools. Examples include:

Natural resource mgmt **5.** Create a Transfer of Development Rights (TDR) program with designated sending areas on privately-owned land that has been assigned a preservation category on the future land use map.

A. Receiving areas could include tax-forfeit lands that have been designated for development or specific locations where development pressure is known to be high.

B. Ensure market demand by creating mandatory participation in the TDR program for proposed developments using tax-forfeit parcels.

C. Link the TDR program to the zoning ordinance, perhaps by requiring participation in the TDR program in specific districts.

Natural resource mgmt **6.** Create a Purchase of Development Rights (PDR) program to acquire conservation easements from willing landowners in Preservation areas.

A. Identify an appropriate entity to hold the easements, a source of

Wetland Assessment Techniques

Several assessment approaches can be applied to characterize existing functions of wetlands and riparian areas. Some examples include:

- Minnesota Routine Assessment Method
- Hydrogeomorphic Approach to the Functional Assessment of Wetlands (HGM) was developed by the USACE Waterways Experiment Station (USACE Waterways Experiment Station, 1995)
- EPA's Office of Wetlands has several Fact Sheets available that provide information on protecting and monitoring wetlands. See the EPA Office of Wetlands' website, http://www.epa.gov/owow/wetlands/facts/contents.html for a complete list of wetlands fact sheets and other technical information.

Buffer Concepts

Based on the majority of scientific findings, land use practitioners should plan for buffer strips that are a minimum of 25 meters in width to provide nutrient and pollutant removal; a minimum of 30 meters to provide temperature and microclimate regulation and sediment removal; a minimum of 50 meters to provide detrital input and bank stabilization; and over 100 meters to provide for wildlife habitat functions. To provide water quality and wildlife protection, buffers of at least 100 meters are recommended

Excerpt from Conservation Thresholds for Land Use Planners, The Environmental Law Institute, 2003, Washington D.C.

funding for purchase, and criteria by which applications for participation could be evaluated.

B. Consider creating a public entity managed by the most appropriate city department to manage conservation easements.

Natural resourse mgmt **7.** Use density bonuses or regulatory flexibility within the zoning code to encourage conservation easements within or adjacent to preservation areas where public purchase or use of TDRs are not practicable.

The City's regulatory implementation efforts need to be complemented with promotional and educational efforts that help residents, businesses, and developers understand the basis for regulations. Successful education efforts can reduce the need for regulation, and make even limited regulation more effective. Promotional and educational programs, furthermore, can be undertaken by non-City entities such as non-profit organizations and businesses. Examples of promotional and educational efforts include:

Natural resource mgmt **8.** Create educational and promotional programs that demonstrate how best to meet Comprehensive Plan principles, policies, and desired future land uses.

A. Create and publicize model conservation designs, such as conservation subdivision and resource-sensitive development techniques, to encourage proactive design changes in new developments.

B. Provide packets to new and existing homeowners and renters on ways to protect the City's water resources from nonpoint source pollutants, including design and installation of infiltration areas, proper disposal of solid waste, appropriate lawn care practices, and sump system disconnects.

C. Publicize the link between dumping and degradation of water quality.

D. Emphasize the cumulative impacts to guide setback and impervious surface standards for shoreland areas.

E. Recognize and promote voluntary business-driven programs that encourage pollution prevention exceeding regulatory minimums.

F. Continue to support Duluth's Cities for Climate Protection program.

Natural resource mgmt **9.** Create dialogue and opportunities for joint action with other units of government on improving impaired waters:

A. Work closely with the Minnesota Pollution Control Agency and nearby communities to restore Duluth's impaired waters.

B. Target other waters that have watershed boundaries outside Duluth for early action to avoid these waters being listed as impaired in the future.

Watershed Strategy

A watershed approach is a useful framework to prevent pollution, achieve and sustain environmental improvements, and meet other Comprehensive Plan goals. Although watershed approaches vary in terms of specific objectives, priorities, elements, timing, and resources, successful efforts are based on the following principles:

Partnerships. Those people most affected by management decisions are involved throughout and shape key decisions. This ensures that environmental objectives are well integrated with those for economic stability and other social and cultural goals. Partnerships also ensure that the people who depend on the natural resources within the watersheds are well informed and participate in planning and implementation activities.

Geographic focus. Activities are directed within the areas that drain to the City's streams. Cooperation between multiple landowners and political jurisdictions is essential.

Sound management techniques based on strong science and data. Collectively, watershed stakeholders employ sound scientific data, tools, and techniques in an interactive decision-making process. This process should include:

- Assessment and characterization of the natural resources (i.e. wetland functions, channel morphology, vegetation type, etc.) and the communities that depend on them.
- Goal setting and identification of environmental objectives based on the condition or vulnerability of resources and the needs of the aquatic ecosystem and the people in the community.
- Identification of priority watersheds across the City and the specific problems within these priority watersheds.
- Development of specific management options and action plans.
- Implementation.
- Evaluation of effectiveness (monitoring) and revision of plans.

The nature of the watershed approach encourages partners to set goals and targets and to make progress based on available information while continuing analysis and verification where information is incomplete.

Public lands and infrastructure management

Investment in infrastructure, including streets, wastewater and water systems, trails, transit facilities, and park and open space improvements, are among the City's primary tools for managing development and improving the quality of life. City investments in land, whether through purchase or the use of easements or land exchange, can improve the natural resource or recreational value of public land and can achieve goals for both preservation and economic development. City investments in historic buildings and sites, or City assistance in restoration, can help to implement the plan's preservation and revitalization policies. Public improvement or investment strategies should include:

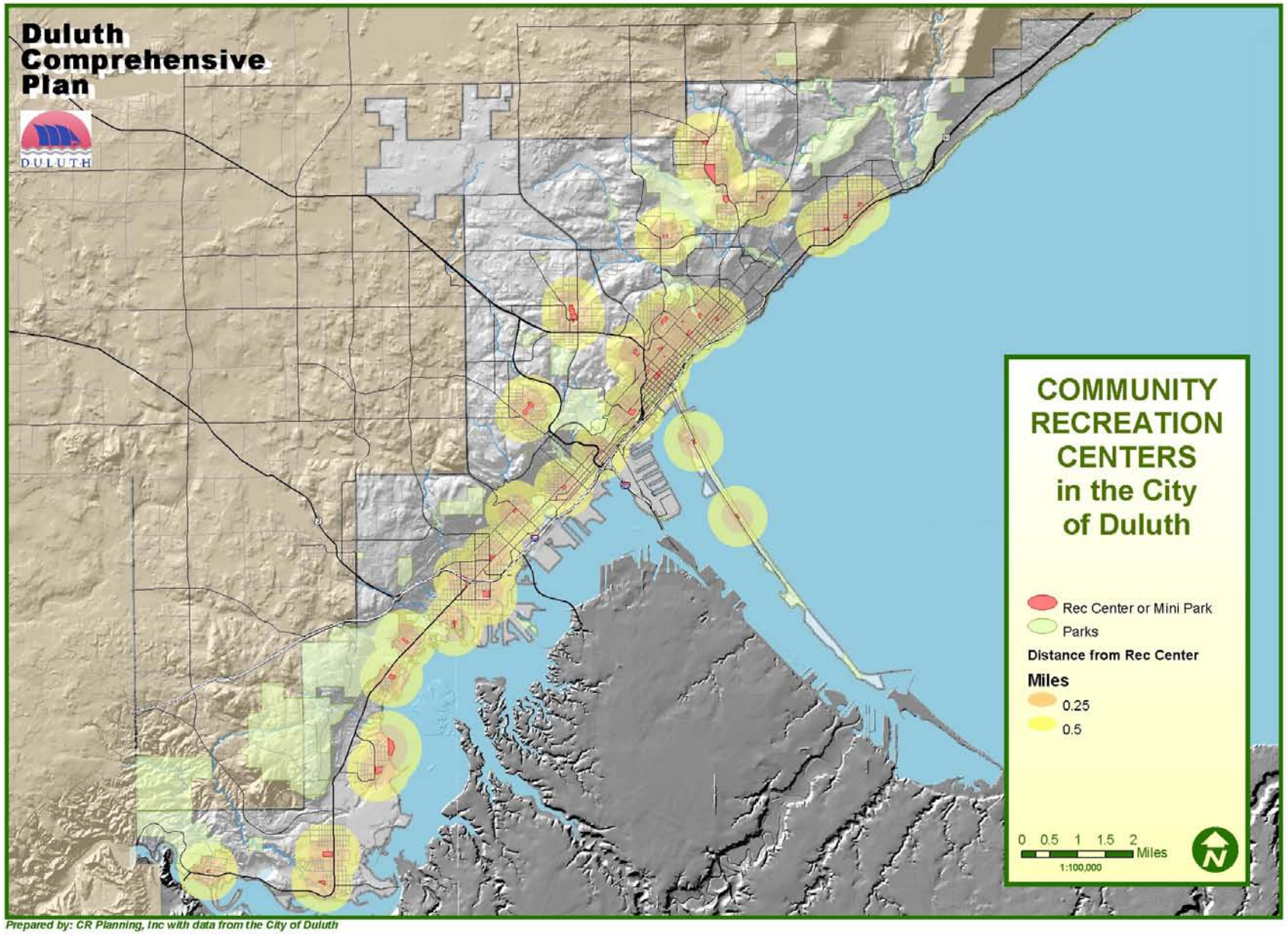
Public lands 1. Revise the City's Street Improvement Program to align with the transportation improvement, historic and natural resource protection, and urban design priorities of the Comprehensive Plan.

- **A.** Public right-of-way and street design standards should address traffic safety, street management costs, neighborhood character and historic resources, impact on other infrastructure such as stormwater facilities, and alternatives to automobile travel.
- **B.** Use pedestrian level of service standards to evaluate development proposals and roadway improvement projects.

Public lands 2. Establish priorities for park and trail improvements and align these with the priorities of the Comprehensive Plan.

- **A.** Create a park and open space plan and a trails master plan are needed to assess access to parks and trails, prioritize investments, create connectivity, and improve linear green spaces and connectivity for habitat (see discussion in Comprehensive Plan Enhancements).
- **B.** A park dedication requirement within the subdivision process or within an integrated development review and approval process could provide either funds or land to meet capital needs for park and trail development.
- **C.** Work with St. Louis County to identify tax forfeit parcels that should be conveyed to the City as park or recreation areas. Prioritize those areas that already have a clearly defined recreational or natural system value.

Figure I-1: Community Recreation Centers



D. Evaluate City-owned or managed areas that serve as informal park or recreation areas to be designated as official parkland.

Public lands 3. Provide for community recreation centers where service area gaps exist and maintain and staff existing community recreation centers.

Public lands 4. Create assistance and incentive programs for renovation of historic buildings, such as façade improvement grants, transferable development rights, the purchase of façade easements, and design assistance with building code issues.

Public lands 5. Identify proactive infrastructure investments to encourage private investment in blighted or contaminated commercial and industrial areas. Consider investments such as:

A. Water and wastewater capacity improvements or extensions.

B. Transportation improvements including transit facilities.

C. Green infrastructure including stormwater management.

D. Facilities that can act as recreational or visual assets to future development.

Figure I-2: Grand Avenue/Michigan Street

Public lands 6. Use tax increment financing (TIF), interest write-downs, tax-free zones, selective co-funding, or similar economic development incentives to encourage private investment in targeted high-priority re-development sites on the future land use map. Limit the use of such tools in areas that are not priorities or fail to meet staging thresholds.

Plan enhancements

A number of decisions are made in the Comprehensive Plan process in the face of uncertainty. The assignment of land use categories on the future land use map cannot anticipate evolving housing and commercial markets, regional economic changes that call for more or different infrastructure, and resolution of transportation or natural resource issues that change the assumptions upon which the Comprehensive Plan is based. A number of sites are identified on the future land use map where such uncertainties are known to exist.

Plan enhancements 1. Revisit the Comprehensive Plan at least every five years to identify and adopt necessary updates and modifications.

A. The Planning Commission should initiate and lead the update process,

B. The process should include public input and participation in the decision-making process by a breadth of stakeholders,

C. The process should incorporate the results of newly completed studies and master plans identified below.

Plan enhancements 2. The City will initiate studies for expanded industrial areas or mixed use centers that can ultimately guide Comprehensive Plan revisions:

A. *Oneota Industrial Park* - Consider whether where infrastructure capacity is sufficient for expansion and where natural systems can be enhanced or restored in expansion areas. Consider both on-site and off-site remediation strategies.

B. *Airpark Business Park* - Consider wetland mitigation, headwaters protection, and airport noise and safety zone delineations.

C. *Eastern Port area, including Slip 2 and the Georgia Pacific Site* - Consider linkages to Lincoln Park business area, possible commercial waterfront and tourism investment, recreation or tourism opportunities that work in synergy with port operations and waterfront neighborhoods, and buffers or other methods to protect adjacent shipping activities and waterfront industrial uses from encroachment or nuisance complaints.

D. Consider designating new areas or expansion areas for eco-industrial planning, investment and development.

Plan enhancements 3. The City will initiate studies to better guide the scope of commercial and mixed use development and to assist in creating form-based standards:

A. London Rd (10th-26th Ave. E., including the plaza district by the Armory).

Figure I-3: Superior Street

Figure I-4: London Road/Endion

Figure I-5: Antennae Farm

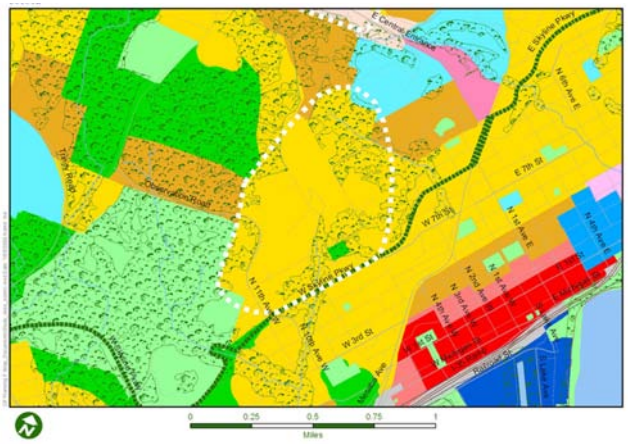
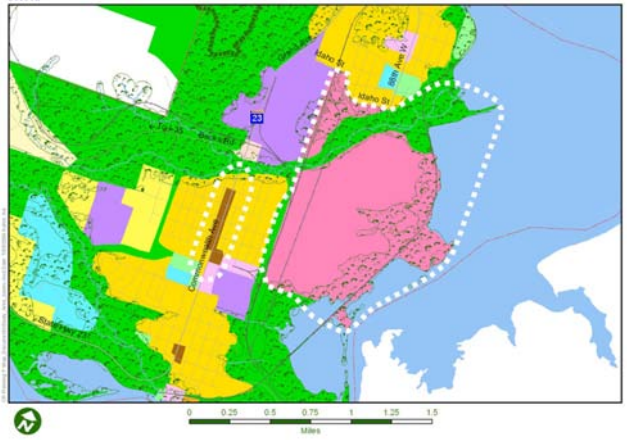


Figure I-6: Commonwealth Ave/US Steel Site



B. Central Entrance.

C. Grand Avenue.

D. Superior St. (Lincoln Park).

E. Superior St. (Lakeside-Lester Park).

F. Commonwealth Ave. (Gary-New Duluth).

G. Arrowhead Road and Rice Lake Road (Northwest Corner).

Plan enhancements 4. The City will require master plans for large development sites, consistent with plan policies, including three sites identified on the future land use map:

A. *U.S. Steel Site* - Including evaluations for limited development of St. Louis River shoreland and opportunities for meeting preservation goals along most of the River,

B. *Western Port Area* - Including incorporation of planned remediation areas and buffering industrial areas from adjacent residential.

C. *'Antennae Farm' Area* - includes primarily residential land uses, protection of open space areas, and protection of veiwsheds at the crest of the ridge.

D. *Higher Educational Facilities* - Work with institutions on expansion plans

E. *Other Large Development Projects Exceeding 100 Acres* - and requiring environmental review.

Plan enhancements 5. The City will evaluate its shoreland areas along Lake Superior and the St. Louis River for development or preservation potential:

A. Coordinate evaluation with specific area plans along the shoreline areas, including the U.S. Steel Site, the east and west Port areas, and other studies and plans for the shipping channel and Port facilities and the St. Louis River estuary.

B. Identify shoreland development and preservation priorities within the general categories portrayed on the future land use map.

C. Preserve public access opportunities and identify future public access opportunities. Map public access points to and from the water and map shoreline natural resource areas.

D. Recommend strategies specific to shoreline areas (i.e., protection buffers based on natural resource functions) for ensuring that development responds to the natural, cultural, and recreational aspects of the shoreline.

Plan enhancements 6. The City will evaluate appropriate integration of undeveloped land owned (fee-title) by non-City public entities (i.e. St. Louis County and the School District), into the Comprehensive Plan should the land be placed on the open market:

A. Consider fiscal impacts on the local government unit and on the City of Duluth,

B. Assess opportunities for retaining historic public use or benefits of undeveloped public land, including informal historic uses,

C. Identify opportunities for land exchange

D. Consider master planning to ensure consistency of potential non-public development with the Comprehensive Plan policies and future land use map.

In addition to those areas where uncertainty requires additional study as part of the implementation process, specific additional studies or planning efforts are necessary to follow the Plan's governing principles:

Plan enhancements 7. The City will create a park and open space plan to guide investment, management, and program development. The park plan should:

A. Prioritize investment in existing facilities.

B. Identify criteria for creating additional facilities in areas underserved by the existing park system.

C. Identify criteria for land exchanges with private land owners that enhance doorstep recreational opportunities for residents and visitors.

Figure I-7: Riverfront

D. Identify funding mechanisms to allow ongoing maintenance improvements.

E. Conduct a needs analysis for both facilities and programs.

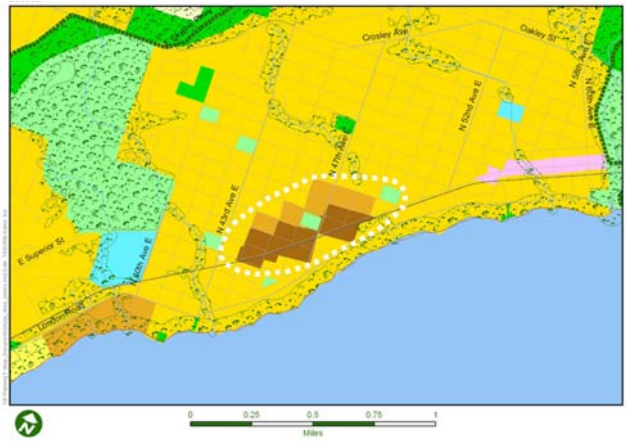
Plan enhancements 8. The City will create a trails plan to:

A. Meet the transportation aspects of Duluth's trail network (described in the Transportation Implementation section)

B. Meet recreational trail needs to accommodate a variety of user groups and need for specific types of trails (bicycle, snowmobile, cross country skiing, hiking, etc).

C. Work cooperatively on trail planning, creation, and maintenance with non-profit trail organizations and clubs.

Figure I-8: Lakeside-Lester Park



Plan enhancements 9. The City will conduct inventories of its historic buildings and places to:

A. Better inform the geographic definition of the Comprehensive Plan historic overlay.

B. Guide and support local historic designation efforts.

C. Guide and support nomination of eligible properties and districts to the National Register of Historic Places.

D. Assist in fund raising efforts for meeting historic protection policies.

E. Integrate the existing and planned historic inventories into a more cohesive and comprehensive planning framework.

Transportation

The Comprehensive Plan provides guidance to City decisions not only on land use but on infrastructure investments and planning. Transportation infrastructure (roads, trails, transit) connects land uses within the City and between land uses inside the City with critical transportation routes outside the City. Road infrastructure is frequently the key that opens an undeveloped area to development pressure. Extending transportation infrastructure, and roads in particular, creates a long-term maintenance commitment for the City, as the road must be plowed, cleaned, repaired, and ultimately rebuilt.

> Duluth, more than most cities, needs a reliable topographic survey of the area over which future growth will spread. The lack of such surveys has been largely responsible for many of the indefensible stupidities encountered in attempting to get about the city...
>
> Source: *Major Street Plan, 1927, P.7*

Transportation and the future land use map and policies

The future land use map shows the preferred mix of land uses but does not detail the complex set of issues related to connectivity. This section of the plan addresses the broad issue of connectivity and the infrastructure that supports connectivity.

Connectivity includes several infrastructure components, including the following:

- Automobile and truck routes, including the network of streets and highways of varying types, the associated parking facilities necessary for automobile travel, and the facilities for public transit.
- Pedestrian routes, including trails and sidewalks throughout the year.
- Bicycle routes, including co-use of streets with motorized vehicles, on-street trails, and dedicated trails.
- Rail and air travel, both for freight and passenger transport.
- Water transportation, primarily commodities and freight using the harbor facilities and Great Lakes shipping routes, but also including passenger service.
- Other connectivity, including a variety of trail types and uses.

Implementation priorities for the transportation policies in the plan that focus on these connectivity components are frequently overlapping. For example, pedestrian issues are inextricably linked to road and highway issues and transit issues. Rail and water transportation issues are tied both to each other and to highway connectivity. This section presents implementation priorities in the following categories:

1. Automobile, pedestrian, and transit connectivity
2. Trail network and bicycle access
3. Economic connectivity

Automobile, pedestrian, and transit connectivity

Of all the connectivity components, streets, highways, sidewalks, and transit system are Duluth's largest public infrastructure investment in both geographic extent and cost. The City's 530 miles of streets and highways comprise over 10% of its total land cover. Access to a street is a requirement for every single home or business in the City.

This implementation section examines the road, pedestrian, and transit issues that were raised in Comprehensive Plan meetings, neighborhood district plans, the Metropolitan Interstate Commission's (MIC) Long Range Transportation Plan, and a myriad of smaller transportation studies. Some of the issues are the focus of on-going studies, while others have only been identified as needing study or action.

The site-specific transportation issues discussed in this section are not intended to be a complete inventory of City's automobile, pedestrian, and transit issues. The plan does, however, need to address the complex interplay of transportation infrastructure and the preferred land use patterns expressed in the Plan. These issues represent decision points regarding transportation infrastructure investments that relate to both the connectivity issues and the future land use map. The Comprehensive Plan sets the policy foundation for making public infrastructure decisions – the plan does not supplant future decision-making, but identifies the context and priorities that should guide future decisions. The following transportation issues provide a context to guide not only decisions for these specific issues, but also to shed light on addressing other issues not mentioned or not yet to be identified.

This section presents three general categories of road and highway issues:

1. Issues that have been considered in recent (generally post 2000) studies or are currently being studied by the City, MIC or MnDOT. Some of the issues addressed in these studies have been resolved and improvements are planned or under construction. Others remain to be resolved, and this section offers strategies or implementation recommendations to address these issues with future transportation infrastructure investment.

2. Issues that are geographically specific and that have not been the focus of regional or area studies. The neighborhood district plans, produced in the first phase of the planning process in 2001, identified some of these issues, while others were raised during the current process. This section includes preliminary strategic or implementation recommendations on these issues.

3. Issues that are general in nature and geographically widespread (i.e., traffic calming and parking management). The specific application of these issues are too detailed for comprehensive plan recommendations. Such general issues are best addressed at the policy level, where policies are structured to guide future planning and investment decisions.

Figure I-10 (Transportation Implementation Examples Map) shows the geographic locations associated with each of these transportation issues. Each issue is assigned a number on the map. The following discussion identifies the number on the map for each transportation issue.

Prior or ongoing transportation studies

The following examples illustrate the issues relating to corridor management and the difficult balance of maintaining potentially conflicting connectivity goals within a single right of way. The studies conducted for these areas are largely consistent with the land uses proposed in the Comprehensive Plan, but additional consideration needs to be given to integrating multiple modes of transportation either within or across the following areas.

T1. Enhancing regional connectivity. Duluth is a regional center. Maintaining connectivity between regional destinations, such as between Duluth and Iron Range communities, is a primary consideration of a number of transportation investments. One example, MnDOT's **Miller Trunk Highway Access Management Plan** study, demonstrates how regional connectivity and land use choices are inter-related: (Transportation Implementation Examples Map #7, shown in Figure 1-9).

A. Miller Trunk Highway has several intersection improvements and proposed backage/circulator roads serving the Miller Hill Mall and surrounding areas.

Figure I-9

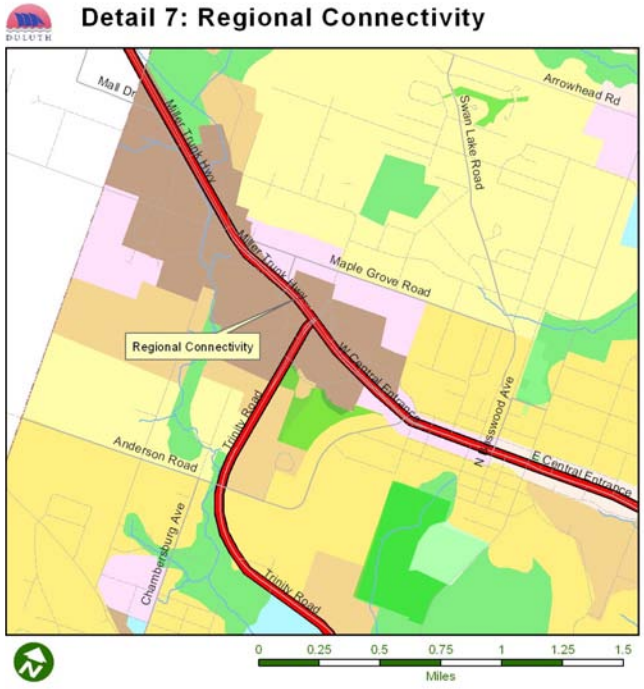


Figure I-10: Transportation Implementation Examples

These improvements are already programmed and are consistent with the regional destination and density of the land uses identified on the future land use map. Trunk Highway 53 is, furthermore, designated by the MnDOT as an Inter-Regional Corridor (IRC) with priority connectivity given to regional traffic. *Regional connectivity does, however, need to be balanced with the need for local automobile and transit access and enhancement of non-motorized modes of travel. Future infrastructure improvements that improve pedestrian and transit access are warranted as housing density increases.*

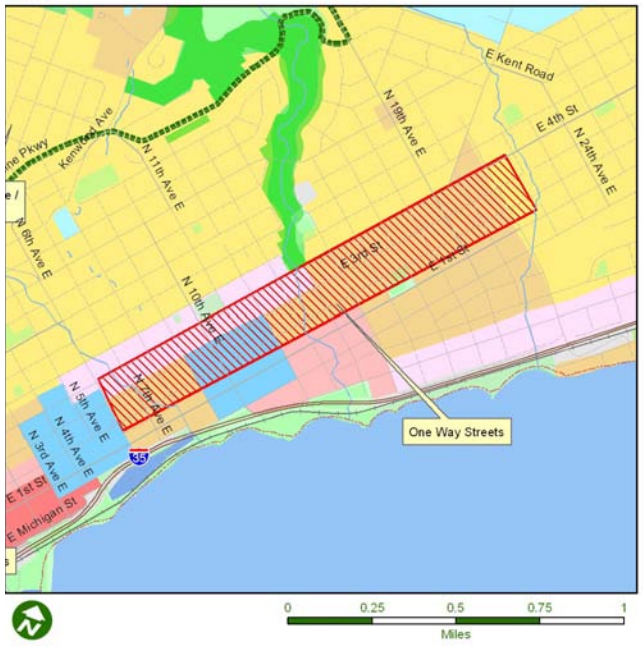
B. **Central Entrance** is proposed to be reconstructed by 2010. The initial proposal has four through-lanes and a raised median/left turn lane and 10 foot wide sidewalks on both sides. The preliminary study includes potential improvements for Palm Street as a parallel route. *Improvements in this area have not been finalized, and should support existing and planned land uses (primarily auto-oriented commercial) with improved streetscaping, consolidating access points, and pedestrian improvements that acknowledge the Traditional Neighborhood designations on either side of the corridor.*

C. **Trinity Road** is proposed to be converted to four through-lanes plus a continuous two-way left-turn lane. This project is underway and supports the proposed land use pattern presented on the future land use map.

T2. **Historic pattern of one-way streets.** Duluth has an extensive system of one-way streets that were designed to move traffic efficiently through commercial areas prior to the construction of Interstate 35. Two recent studies make recommendations to modify the pattern of one-ways to reflect current traffic patterns. Both the 2001 *East Hillside Transportation Study* and the draft recommendations from the *2005 Knight Charrette* addressed the use of one-way streets on 1st, 2nd, 3rd, and 12th and 14th (Transportation Implementation Examples Map #10, shown in Figure I-11). The east-west one-ways were used to carry heavy traffic volumes prior to the completion of I-35. Since then, traffic volumes have been relatively low for one-way streets. These streets are wide (3-lanes on sections of 2nd Street). One-ways are not warranted for the measured traffic volumes and result in high speeds through the East Hillside and Endion neighborhoods. Initially, eliminating 1st Street as one way east of 6th Ave was recommended as a test, as this street was not part of a one-way pair, and a portion of 1st will be converted to two-way traffic this year. *In order to meet the Comprehensive Plan goals for housing and commercial redevelopment the remaining one-way streets (2nd and 3rd Streets, 12th and 14th Avenues) should be returned to two-way status where the future land use map shows residential or*

Figure I-11

Detail 10: Redesigning One-Way Street Patterns



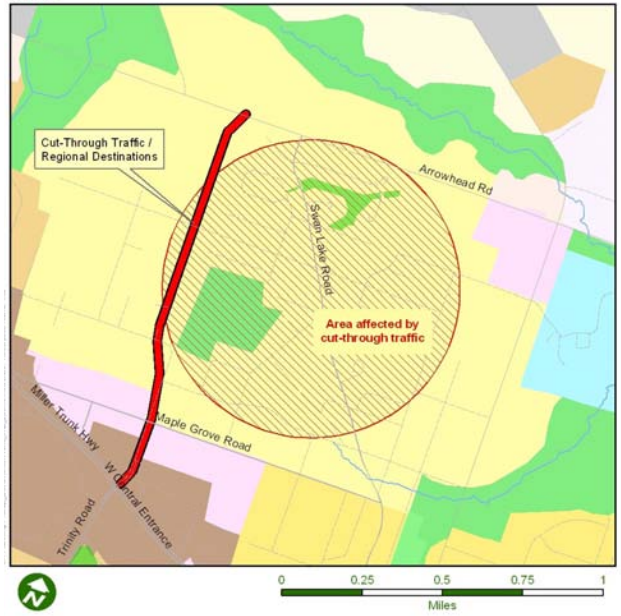
mixed use land uses. Two way traffic patterns will improve the livability and pedestrian environment of these corridors and supports the future land use plan designations of these areas: Central Business Secondary, Medical District, Urban Residential and Neighborhood Mixed Use (See also Policy T6).

Medical facilities in the area of one-way streets have designed entrance and parking facilities around the existing street pattern: change to these medical complexs and changes in streets serving them must be designed in concert. Primary downtown areas or where commercial land uses are dominant, in contrast, will likely still require one-way access to allow for loading and unloading and on-street parking while allowing steady traffic flow.

The implementation strategy discussed above also applies in other areas of the City, including transforming the one-ways in Lincoln Park and areas to the west that parallel Interstate 35 where one-ways are no longer justified by traffic volume. The City should, moreover, work toward a consistency in one-way street patterns, ultimately eliminating the one-way/two-way/one-way patterns (such as now found on 1st Avenue) that are found in several areas of the historic grid, both east and west of the downtown.

Figure I-12

Detail 8: Cut-Through Traffic / Regional Destinations



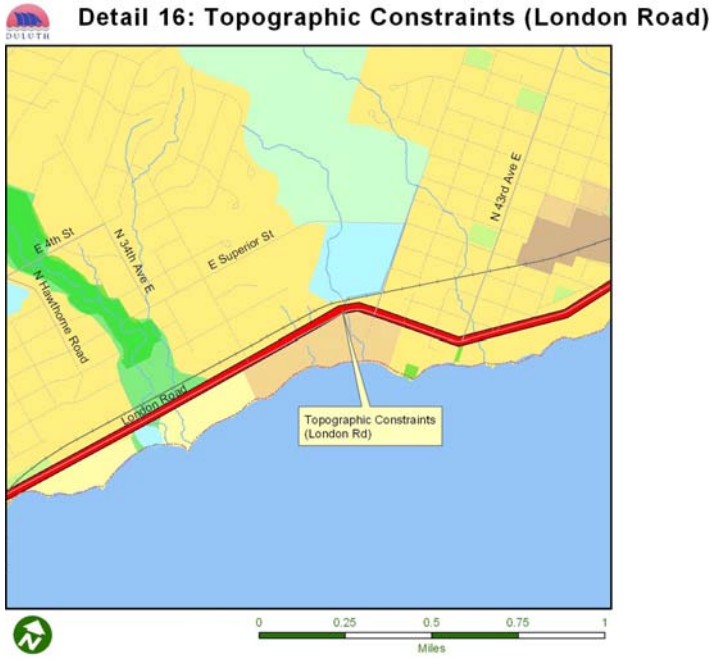
T3. Cut through traffic near regional destinations. Cut-through traffic in residential neighborhoods near regional destinations reduces livability. Areas such as the **Duluth Heights neighborhood** near Miller Hill Mall (Transportation Implementation Examples Map #8, shown in Figure I-12) and neighborhoods around the universities (UMD, St. Scholastica, Lake Superior College) have been struggling with cut-through traffic for years. The Duluth Heights area is currently being studied by MIC. This area sees a significant amount of cut-through traffic for drivers going between Miller Hill Mall and Miller Trunk Highway commercial area and eastern neighborhoods via Arrowhead Road. One solution being considered is to provide a more direct connection by creating a new arterial extending Trinity Road at Miller Trunk Highway north along Joshua Street to Arrowhead Road. This improvement would support the future land use map designation of Duluth Heights as Traditional and Low-Density Neighborhood. The new arterial is proposed to eliminate traffic cutting through residential neighborhoods from Arrowhead Road to the Miller Hill Mall area (additional traffic modeling info may be available soon from MIC). *Consistent with the Comprehensive Plan, the proposed arterial should include access management standards that preserve the arterial function while allowing some access from the neighborhood (see Policy T4). Considerations should also be given to pedestrian movement in the ultimate road and intersection designs.*

T4. Balancing local and regional connectivity. Balancing the goals of improving regional connections while protecting local access presents a dilemma for land use and transportation planning. The **Rice Lake Road Corridor** (Transportation Implementation Examples Map #9), currently being studied by MIC, provides an example of this dilemma. Improvements are warranted at a number of intersections along this corridor. Rice Lake Road will also likely warrant a 5-lane configuration in the future. South of Arrowhead there are pedestrian/bike concerns and safety issues related to Lowell Elementary School. The future land use map shows higher density housing south of Arrowhead Road and business park expansion north of Arrowhead. *The possible improvements (five-lane configuration and intersection improvements) would support proposed land uses along the corridor. Additional consideration needs to be given to bicycle safety (it is a designated but unsigned bicycle route), transit facilities associated with Urban Residential areas, and pedestrian level of service around Lowell School and the Urban Residential areas.*

T5. Improving pedestrian and transit access in areas with Neighborhood Commercial and Mixed Use designations. The **Lincoln Park Transportation Assessment** (Transportation Implementation Examples Map #5) identified **3rd Street** for needed traffic calming and pedestrian improvements, including boulevard trees and curb bulb-outs. The study also identified sidewalks in need of upgrading and recommended parking management strategies. *The Lincoln Park area is an example of where investments in public facilities and improved management of parking could meet the Neighborhood Commercial and Neighborhood Mixed Use goals shown on the future land use map. Lincoln Park Commercial District is a relatively pedestrian friendly area that would be enhanced by the recommended improvements, all of which are consistent with the future land use map designations of Neighborhood Mixed Use and Traditional Neighborhood.*

T6. Addressing regional connectivity in a topographically constrained landscape. Duluth's topography has created some significant challenges in managing transportation risk. **London Road (26th Avenue E. to 60th Avenue E.)** (Transportation Implementation Examples Map #16, shown in Figure I-13) provides the connection from I-35 to State Trunk Highway 61 expressway through a largely residential neighborhood. The future land use map designates most of this stretch as Traditional Neighborhood with some areas of Urban Residential. While average traffic volume through the neighborhood is relatively manageable, peak volumes with tourist traffic can be quite a bit higher (2002 AADT at 26th Avenue E. was

Figure I-13



19,600), and significant safety concerns with commercial traffic further raises the risks of the existing configuration. Potential solutions, studied over the last twenty years, are all problematic and enormously expensive. Alternative routes for commercial vehicles are similarly in conflict with the future land use map. *MnDOT has initiated a new study to examine potential mitigating strategies for the heavy traffic/congestion issues. The findings of this study should be assessed when they become available. (See also Policy T7).*

Local and geographically specific issues

The following issues come from comments at Comprehensive Plan meetings identified where local or geographically specific connectivity issues are closely integrated with the Plan's future land use map and policies recommendations. These issues are also identified on the Transportation Issues Map.

T7. The following areas are recommended for specific investment actions or planning:

A. **Upgrade the Morgan Park Loop** (Transportation Implementation Examples Map #2). The Morgan Park loop could be upgraded by improving Idaho Street and determining the feasibility of removing the DM&IR trestle over it. Morgan Park is recognized for its historic resources not only in building form but in the planned layout of the neighborhood and the relationship of buildings to streets. *Traffic patterns and the preferred future land uses in the Morgan Park area support upgrading this road. Should residential development be part of the U.S. Steel Site re-development the loop could be a reasonable means of connecting these neighborhoods, but non-residential land uses should not be connected to the Morgan Park Loop. Potential site connections, as well as transitions or barriers between uses should be specific elements of the U.S. Steel Site master plan.*

B. Connect the **U.S. Steel re-development/ master planning site** to Commonwealth Avenue and Beck's Road (Transportation Implementation Examples Map #1) The Comprehensive Plan has designated the U.S. Steel Site as a General Mixed Use site in need of a master plan. Future land uses could include business and job center activities as well as residential, commercial waterfront, and preservation and recreation areas. *The significant public and private investment in this large area will require substantial transportation planning to connect the site to regional arterials (most notably Commonwealth Avenue and Beck's Road). The master plan needs to incorporate these connections, in addition to trail and pedestrian connections with existing and planned trail corridors and, if warranted, adjacent residential areas.*

C. **Develop a second vehicular exit from Riverside neighborhood** (Transportation Implementation Examples Map #3). The future land use map identifies expansion and re-development of the Riverside marina, and improved connections to the lower Spirit Mountain area with recreation focused developments. *The second access to Riverside will improve connectivity and access, for public safety reasons, to a relatively dense urban neighborhood. Investing in infrastructure for a second access point will enhance the likelihood of meeting Comprehensive Plan goals both in Riverside and adjacent areas.*

D. **Improve traffic flow and pedestrian-friendly environment on Grand Avenue.** Grand Ave, a wide east-west arterial does not provide a pedestrian/transit friendly environment (Transportation Implementation Examples Map #4, shown in Figure I-14). However, the City is re-striping the West Duluth Commercial area to 3-lanes, in part to slow traffic and help improve the pedestrian environment. *The on-going City efforts will improve the pedestrian and transit environment. The City should continue pedestrian improvements and re-striping between Lincoln Park and the hwy 23's I-35 interchange.*

E. **Kenwood Avenue** is a four-lane road, with significant volume of traffic (11,300 AADT) and essentially terminates at a 7-legged intersection with Skyline Parkway (Transportation Implementation Examples Map #11). The intersection was recently converted to all-way stop (which has been successful in improving safety). Connecting Kenwood more directly to 6th Avenue has long been discussed and included in plans, including the East Hillside Transportation Study. A number of configurations have been studied, most of which were ultimately rejected. Remaining mitigating issues include the future status of Grant Elementary School. *The proposed connection would improve traffic flow and remove some traffic from neighborhood streets. The ultimate alignment needs to be designed to have minimum impact on existing neighborhood land uses. Additional discussion and joint planning with the School District in regard to the status of Grant School will improve decision-making. After resolution of the future of Grant School, final planning should proceed and the improvement should be implemented.*

F. **London Road between 12th Ave and 26th Ave** (Transportation Implementation Examples Map #15, shown in Figure I-15) is a commercial area with very wide pavement, which upon completion of I-35 is no longer warranted by traffic demand. The planned land use, shown on the future land use map, is primarily Neighborhood Mixed Use. Making the area more pedestrian-friendly directly encourages the type of land use priorities in the Plan, and should im-

Figure I-14

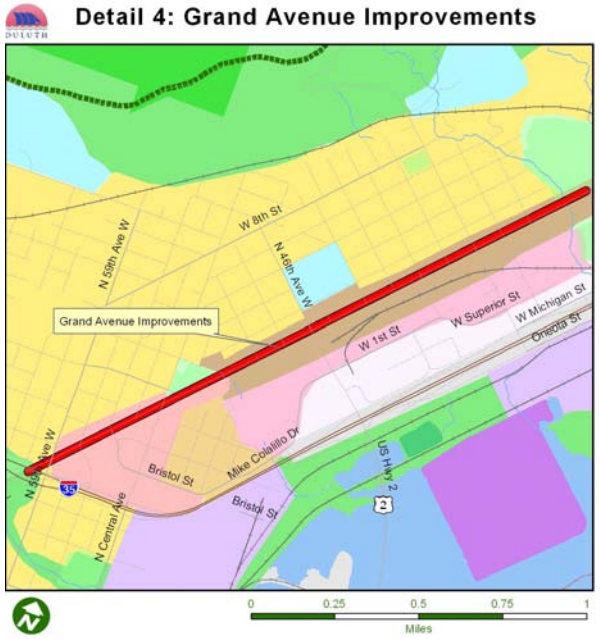
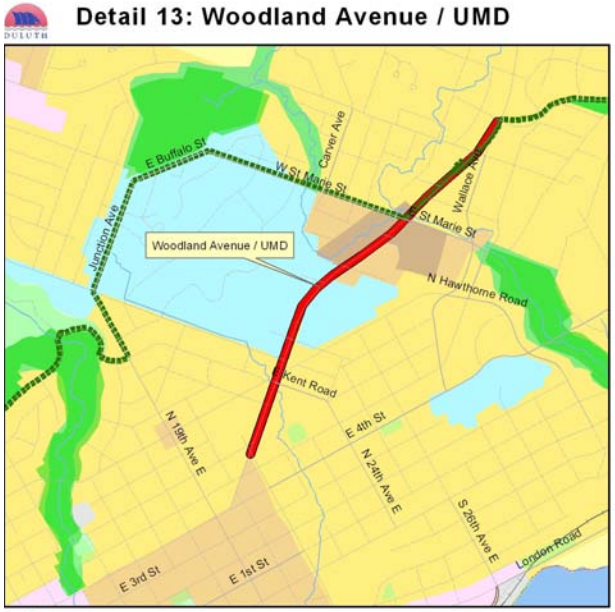


Figure I-15

Figure I-16



prove the business environment for the commercial investment along this corridor. The City previously studied the corridor aesthetics, streetscape, business environment, and pedestrian-friendliness (the 1995 Endion Plan), but chose not to move ahead with the recommendations. *The City should revisit the Endion Plan recommendations and re-assess potential for street narrowing and other streetscape/pedestrian improvements. A staged plan for business reinvestment and public realm improvements could transform this area over time to meet Comprehensive Plan goals.*

T8. Study areas for optimal transportation solutions. Some geographically specific transportation issues clearly warrant attention, given the Plan's preferred land uses and policies. However, the potential solutions carry risks that may out-weigh the opportunities that could be realized by making transportation investments. These issues are recommended for further study:

A. The **Woodland Avenue and Arrowhead Road** corridors are projected to continue to worsen in regard to traffic flow. The Metropolitan Interstate Commission (MIC) should examine and make recommendations for flow improvements and potential new connecting corridors. These include:

i. A connection from Anoka St./Maxwell Ave. to Howard Gnesen Road (**"Woodland Backdoor,"** Transportation Implementation Examples Map #12) may relieve some traffic on Arrowhead Road and offer new connectivity in an area that has some potential for infill growth. *This proposal would improve connectivity for a Traditional Neighborhood area, and could allow for infill and neighborhood expansion consistent with Comprehensive Plan governing principles. The proposal may also, however, have substantial environmental impacts, as the new corridor would have to cross sensitive lands including a stream. Additional traffic modeling, evaluation of wetland mitigation and habitat impacts, and costs of sufficiently mitigating impacts to the stream corridor need to be considered in order to make an informed decision on this potential transportation infrastructure investment.*

ii. **Woodland Avenue, 21st Avenue E. to Arrowhead Road** (Transportation Implementation Examples Map #13, shown in Figure I-16). Heavy traffic and relatively high speeds along Woodland Avenue have affected pedestrian movement and livability of adjacent residential neighborhoods. Much of the traffic is related to the nearby colleges (UMD and St. Scholastica). These corridors are not as pedestrian friendly as desired, given the land uses served by this corridor, including UMD, St. Scholastica, neighborhood commercial businesses, and the corridor's role as a transit

route. Additional concerns along St. Marie and College Street are linked to this corridor. UMD's proposed new entrance on Woodland may ease some problems on College Street, but will create the need for more signals and additional left turns on Woodland. *Methods of alleviating congestion and conflicts between travel modes have been and continue to be evaluated. Alternative routes have potential conflicts with neighborhood land uses. Increased emphasis on alternative modes of travel (pedestrian, bicycle, transit) will improve travel options but are unlikely to reduce congestion.*

iii. **Congestion/heavy traffic on Arrowhead Rd** (Transportation Implementation Examples Map #14, shown in Figure I-17) between Woodland and Kenwood Avenue. Arrowhead becomes 4-lane west of Kenwood, but is two-lanes to the east. The limited right-of-way restricts adding lanes or buffering adjacent residential neighborhood from increased traffic or higher traffic speeds. UMD is a major destination in this area, but has no direct access from Arrowhead. *Transportation and road planning in this area needs to consider UMD as a regional destination with traffic converging from all directions. The City should engage in further study, in conjunction with UMD, to consider new entrance concepts, including a north entrance from Arrowhead that would remove traffic from Woodland and the Carver/Arrowhead intersection. Additional exploration is warranted for streetscape improvements for traffic calming, improved pedestrian and bicycle connections and facilities, and supporting existing and new transit connections based on the origins and destinations for Arrowhead Road traffic flow.*

Figure I-17

B. **Commuter rail service.** The **North Shore Railroad line** (Transportation Implementation Examples Map #19) currently used for scenic train rides, provides a potential commuter rail corridor. The Duluth Transit Authority (DTA) recently utilized the 'Budd Car,' a self powered rail passenger car, for a test trial of such a service. The DTA serves a significant number of transit riders compared to other Midwestern cities of similar size. *Given the city's density and its linear east-west orientation, some type of fixed guideway transit option may be viable, warranting further study. The City should continue to study rail options, including commuter rail, streetcar, and other fixed guideway technologies.*

C. **Inter-city passenger service.** Duluth does not have an inter-city passenger rail connection. Growing interest in rail service is apparent in the success of revived regional service in the Twin Cities metropolitan region. *To diversify Duluth's automobile connection with the Twin Cities markets, Duluth should*

study potential future connections with the commuter rail system in the Twin Cities.

Policy-level transportation issues

Several policy issues raised in neighborhood district plans and at Comprehensive Plan meetings apply in a number of areas across Duluth. These concerns have a strong connection to the Comprehensive Plan policies and the future land use map.

T9. Reduce or calm traffic where pedestrian and automobile traffic volumes are high. There are several locations identified where traffic calming is an important issue including Park Point, Canal Park and the Aerial Lift Bridge, Mesaba, 6th Avenue East, Lake Avenue at the freeway entrance, and the Medical District.

Traffic calming is addressed in the Policies section of the Plan (Policy T8): "While traffic calming measures are usually applied to local residential streets, traffic calming is also appropriate for functionally classified streets in residential areas, pedestrian activity areas, and older commercial areas where buildings and sidewalks are close to the street." Many of the areas listed as part of this recommendation are arterial or collector streets or busy commercial/entertainment areas such as Canal Park.

The City can achieve traffic calming in these areas through a combination of the following strategies:

A. Streetscape improvements, parking management and wayfinding signage that allows motorists to park once and move through the area as pedestrians.

B. Implementing the Site Design policies (UD8 through UD14) to enhance the pedestrian environment and help to calm or even reduce traffic.

C. For predominantly residential areas (including much of Park Point), the City should create criteria to evaluate traffic calming requests and identify the most appropriate traffic calming techniques, in response to residents' requests or safety issues. For example, traffic calming should not divert traffic from one neighborhood street to another.

T10. Parking management. Parking has been studied in many locations, notably in the

downtown, Canal Park, and the Medical District (Transportation Issues Map #6). In each case, the issue is less one of supply than of demand management such as managing employee parking or public parking through pricing/incentives, improving wayfinding signage to assist in locating long-term parking, or using permit parking to discourage employee parking in residential neighborhoods.

Addressing parking through the use of the demand management techniques noted above is critical to encouraging the redevelopment efforts in these core areas. The City should pursue the information/educational management strategies (such as wayfinding), and consider a package of strategies for parking management. Strategies could include:

A. The use of parking revenue for commercial district enhancements in order to increase business and customer support for parking fees,

B. Encourage or provide incentives for developments that create shared on-site parking to increase capacity for the larger area,

C. Require travel demand management plans for new developments in areas with parking dilemmas.

T11. Encouraging pedestrian traffic. Pedestrian traffic is a component of several of the geographic issues on the Transportation Issues map. Duluth has a significant number of households that have no access, or only limited access, to an automobile. Students at the institutions of higher education, lower income households, and senior households all have a greater reliance on non-motorized and transit modes of travel. Employment centers, such as the Primary Downtown, the Medical District, the colleges and university, and the Tourism and Entertainment area in Canal Park function much better if relatively easy, year-round pedestrian connections are available between parking areas and the locations of jobs, housing, and errands. Thus Duluth has a significant demand for pedestrian facilities. Two issues have been identified in the Comprehensive Plan process in relationship to pedestrian access; the lack of reasonable facilities in some high demand areas, and the poor condition of existing facilities particularly in winter. Pedestrian access is poorly served, particularly along or across some busy arterials near the campuses, and the downtown, and along Skyline Parkway. The MIC conducted a sidewalk survey of existing facilities and found that many of the high demand areas had infrastructure in poor condition (see Figure I-19). The poor physical condition

Components of a Travel Demand Management (TDM) Plan

The components of a TDM Plan include the following (for a smaller project, not all of the elements will be needed):

1. **Project description:** A description that includes both existing and proposed site characteristics and a complete description of the project with attention to uses that generate trips and parking demand.
2. **City transportation goals and objectives:** A description of the applicable City goals and objectives.
3. **Project TDM goals and objectives:** A description of the goals of the TDM Plan and how these goals are consistent with the City's transportation goals. City staff will work with the applicant to develop the project goals.
4. **Mode split:** Current and future mode splits for single occupant vehicles (SOV), transit, car and van pools, bicyclists, pedestrians, and telecommuters. City staff will work with the applicant to establish future mode splits based on the project TDM Plan goals.
5. **Project impacts:** A description of the transportation impacts of the development.
6. **Mitigating measures:** A description of mitigating measures designed to minimize the transportation impacts of the development.

Source: *Minneapolis TDM Plan Requirement*

of pedestrian infrastructure is exascerbated by inadequate (or non-existant) snow removal.

The City should implement the following strategies to improve opportunities for people to walk to their destinations:

A. Develop a pedestrian level-of-service standard with which to evaluate proposed transportation projects and new development projects, balancing the level-of-service standards for automobile travel with equivalent pedestrian standards.

B. Maintain existing shoveling ordinance provisions, and create an enforcement plan. Conduct education or promotional efforts to alert public and private land owners about their responsibilities in regard to snow shoveling.

C. Invest in pedestrian access (trails and sidewalks) along Skyline Parkway.

D. Invest in pedestrian facilities in high priority areas identified by the MIC and in additional areas assigned a mixed use category on the future land use map. Create a schedule for improving sidewalks in poor condition (as per the MIC sidewalk study), improving sidewalks as part of the Street Improvement Program, and requiring sidewalks in mixed use development or redevelopment site plans.

E. Continue to link the skyway system to the street pedestrian network, and set incentives for new skyway connections for re-developments within or on the edge of the Primary Central Business district.

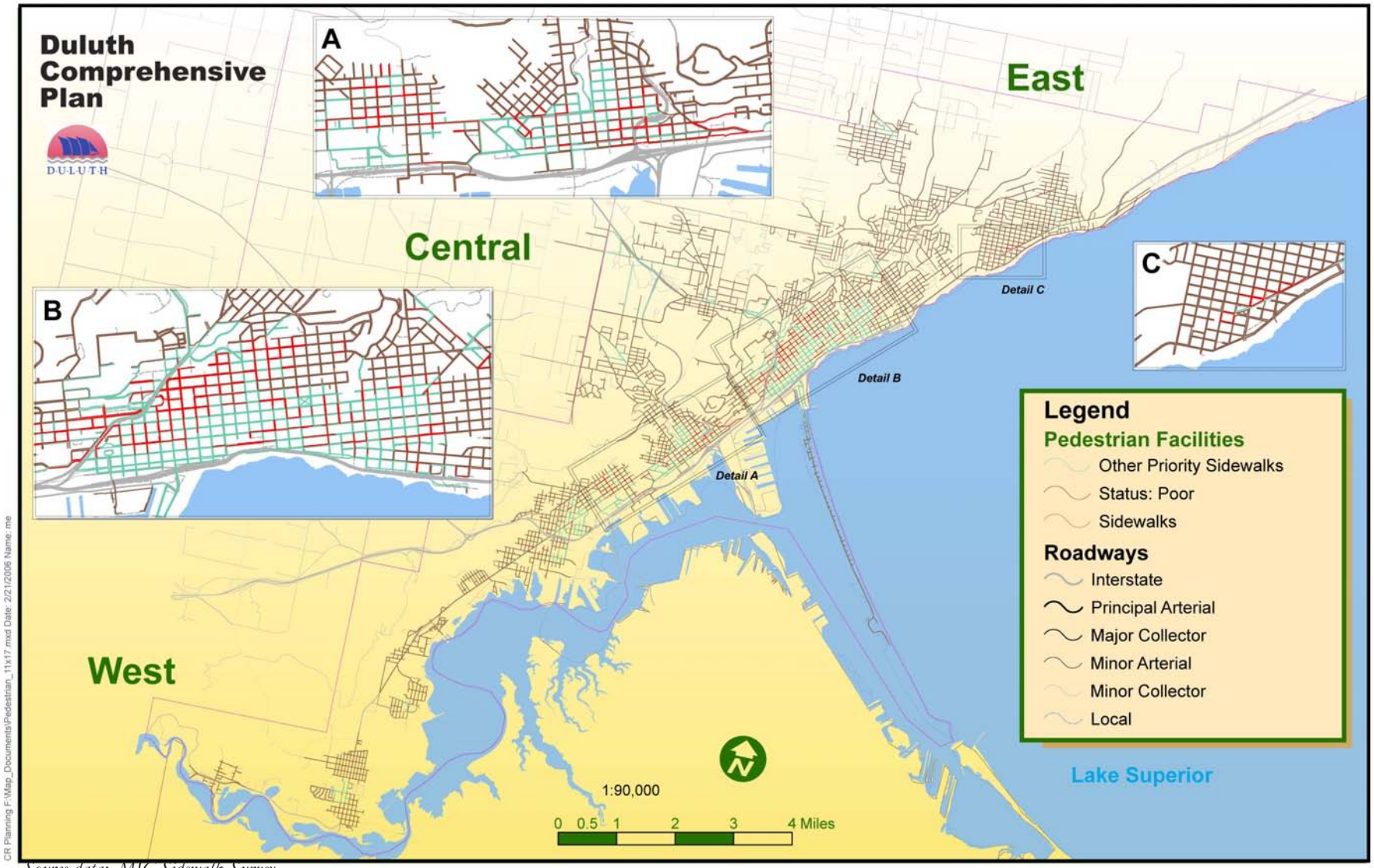
F. Improve the formal trail network to connect all areas of the City with dedicated paths that pedestrians can use (see trails section).

T12. Transit Issues. The Duluth Transit Authority (DTA) provides almost three million rides per year. The transit services are a critical link in maintaining the quality of life for many Duluth residents, and in relieving congestion around many of the City's primary destinations.

The City should consider a range of implementation issues that will enhance transit opportunities, including the following:

Figure I-18: Duluth Transit Map

Figure I-19: Condition of Sidewalks High Priority Routes



Source data: MIC Sidewalk Survey

A. Make public infrastructure investments in transit facilities along transit corridors where neighborhood commercial nodes have been designated on the future land use map, and provide for improvements in facilities at regional commercial centers.

B. Consider incentives such as density bonuses to encourage infill and appropriate redevelopment along transit corridors.

C. Promote transit use to large employers along transit corridors and at major destinations through publicizing federal tax incentives.

D. Consider additional incentive tools that DTA could use, such as direct incentives to employers, continued promotional efforts to higher education student populations, and targeted incentive programs for higher density residential buildings along transit routes.

E. Create a travel demand management planning ordinance, applying to all large development projects, and incorporate the requirements into the development review process.

F. Create transit-oriented development standards within the new zoning ordinance and work with the DTA to identify locations along transit corridors where the standards should apply.

Trail network and bicycle access

Trail systems create vital connectivity and sustain property values by linking housing with linear green spaces and commercial and open space destinations. Trails also provide recreational opportunities, enhance tourism businesses and markets, and put downward pressure on the growth of automobile use. The City of Duluth needs to treat its trail system as an important component of the City's infrastructure system. The City has adopted a number of trail policies, and has a variety of implementation options for realizing its Comprehensive Plan goals.

T13. Create a trails and greenways master plan that identifies standards for trail connectivity, links origins and destinations, and identifies priorities for trail categories, user groups, and investments:

A. Work with non-profit trail groups to identify trail connections and to leverage public funds with volunteer trail construction and enhancement of existing trails and greenways.

B. Link neighborhoods to the parks and green spaces offered for recreational enjoyment.

C. Identify trail right-of-way needs and potential links to existing or planned trail systems across undeveloped lands.

D. Incorporate the existing informal trail system across undeveloped lands.

E. Create a trail network map showing connections, trail types and surfaces, easement and right-of-way search corridors, and priority investments. A conceptual trail connections system is portrayed in Figure I-20. Trail types and surfaces should relate to a clear hierarchy of trail users and the potential need for 1-lane or 2-lane trails, and possible upgrading of trails and rights-of-way in the future.

T14. Connect Duluth trails to trail systems in neighboring communities and regional trails. As part of creating a trails master plan, the City should identify preferred alignments for the following connections:

A. Connect the Munger trail to the route of the scenic highway passing through Duluth and eventually with the Gitchi Gammi trail system being built along the North Shore.

B. Connect Duluth trails to the Superior Hiking Trail system via the high bridge with a paved two lane trail.

C. Connect the Proctor bike trail to the Munger Trail.

D. Connect Hermantown trails to the Duluth trail system.

E. Consider an ATV trail connection in Duluth to regional ATV trails.

T15. Build trails along waterways to connect the people of Duluth to the waters that surround them:

A. Create right of way reservation standards for subdividing riparian land, particularly in areas that are tax-forfeit, to reserve space for public trails and access along streams, rivers, and lake.

B. Stop vacation of right of ways that extend to lake and waterways. Use the rights of way to accommodate trails and water access.

C. Plan for a trail that connects lower Chester Creek (4th Street) to the Lakewalk.

Lake Superior Water Trail

Legislation establishing the Lake Superior Water Trail was enacted in 1993.

[85.0155] LAKE SUPERIOR WATER TRAIL.

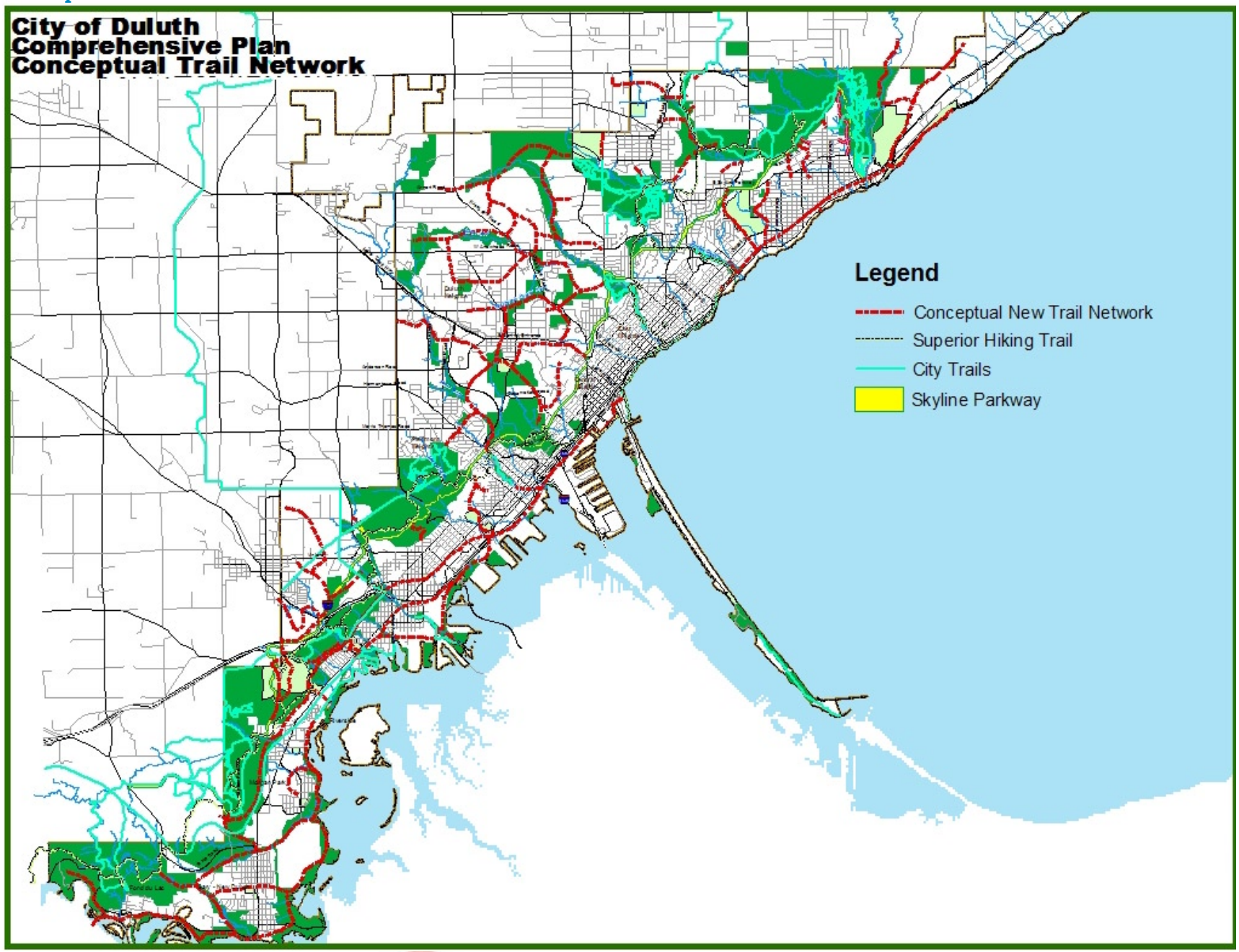
Subdivision 1. CREATION. A water trail is created along the Lake Superior shoreline from Park Point in Duluth to the border with Canada. The trail must be primarily developed for kayakers and campers, using existing public lands for designated rest areas.

Subdivision 2. COMMISSIONER'S DUTIES. The commissioner of natural resources must coordinate the creation of the water trail by placing signs for rest areas along the lake and working with other public agencies and private resorts owning land along the lake to do the same. At the earliest opportunity, the commissioner shall make available a water trail map depicting the designated rest areas for the touring public.

Subdivision 3. GIFTS; DONATIONS. The commissioner of natural resources is authorized to accept donations of land, or easements in land, for rest areas along the Lake Superior water trail, and may seek and accept money for this purpose from other public and private sources.

Source: *Lake Superior Water Trail Master Plan*

Figure I-20: Conceptual Trail Network



D. Create a water trail network with specific access points and amenities for kayaks, canoes, and other non-motorized boats that links to and enhances the Lake Superior Water Trail.

T16. Make Skyline Parkway more pedestrian and bike friendly:

A. Create Skyline Parkway-specific goals and guidelines for designing, designating, and building bike/pedestrian lanes.

B. Prioritize improvements based on recommendations of the Skyline Parkway Corridor Management Plan.

C. Investigate co-funding options with other communities, state and federal agencies, and local institutions and businesses.

D. Investigate options for lowering the speed limit.

T17. Keep trail maintenance costs low in the following ways:

A. Work to enhance existing volunteer efforts and publicly recognize the volunteers from non-profit user groups that perform trail maintenance and building (i.e. Cyclists of the Gitchee Gummee Shores, Lake Superior Hiking Trail Association, Duluth XC Ski Club, Sustainable Trails Alliance, etc.).

B. Keep most trails in the system as single track multi-use, but create rights-of-way that allow for widening as trail usage increases or the need for separation between user types warrants additional width,

C. Only pave trails when high volume warrants, such as on the Lakewalk,

D. Use crushed limestone or similar material as a trail base where moderate volumes of usage warrant,

E. Close unpaved trails during extremely muddy conditions to protect the trail from erosion and damage. Close ski trails from multi-use during fall freeze up.

Required Bicycle Facilities for New Downtown Construction
(Minneapolis Ordinance Example)

Minimum Required Facilities	Building Area				
	At Least 500,000 sq. ft.	At Least 750,000 sq. ft.	At Least 1,000,000 sq. ft.	At Least 1,250,000 sq. ft.	At Least 1,500,000 sq. ft.
Bicycle Parking Spaces	30	45	60	75	90
Showers*	4	5	6	7	8
Full-Size Lockers*	15	22	30	37	45

*The minimum required shall be distributed between men's and women's facilities.

T18. Encourage commuting by bicycle:

- **A.** Identify arterial routes for bicycle and include consideration of bike traffic flow when designing intersections, timing signals, and signing roads.
- **B.** Develop bicycle-friendly street design standards, including:
  - **i.** keeping storm water covers perpendicular to street.
  - **ii.** creating standards for marked bicycle lanes and incorporate into street design standards.
- **C.** Encourage downtown businesses to incorporate bike station concepts in travel demand management plans. Consider co-funding incentives, aggregation of business contributions, or other funding techniques to create centralized bicycle facilities downtown,
- **D.** Consider zoning requirements for provision of bicycle parking for most non-residential development and for bicycle facilities in large commercial or employment center buildings.

T19. Promote Duluth's trail system and trail connections to the region.

- **A.** Advertise trails to residents, visitors, and in business recruitment efforts.
- **B.** Sell maps of the Duluth trail systems for a nominal fee to visitors and use the proceeds to maintain and improve the trail system.

Economic connectivity

While most of the connectivity issues in the City address the needs of individuals, households, and retail markets (services and goods), the Comprehensive Plan also addresses economic

connectivity. The City's shipping, rail, and air facilities, in addition to the intermodal infrastructure that connects to the national highway system, are key elements in sustaining Duluth's economic position and ultimately the quality of life for Duluth residents.

The City has adopted governing principles relating to economic connectivity, incorporated land use needs of the water, rail, and air transport into its future land use map, and identified policies for sustaining economic transportation capabilities. The following implementation strategies will help the City achieve its economic connectivity goals.

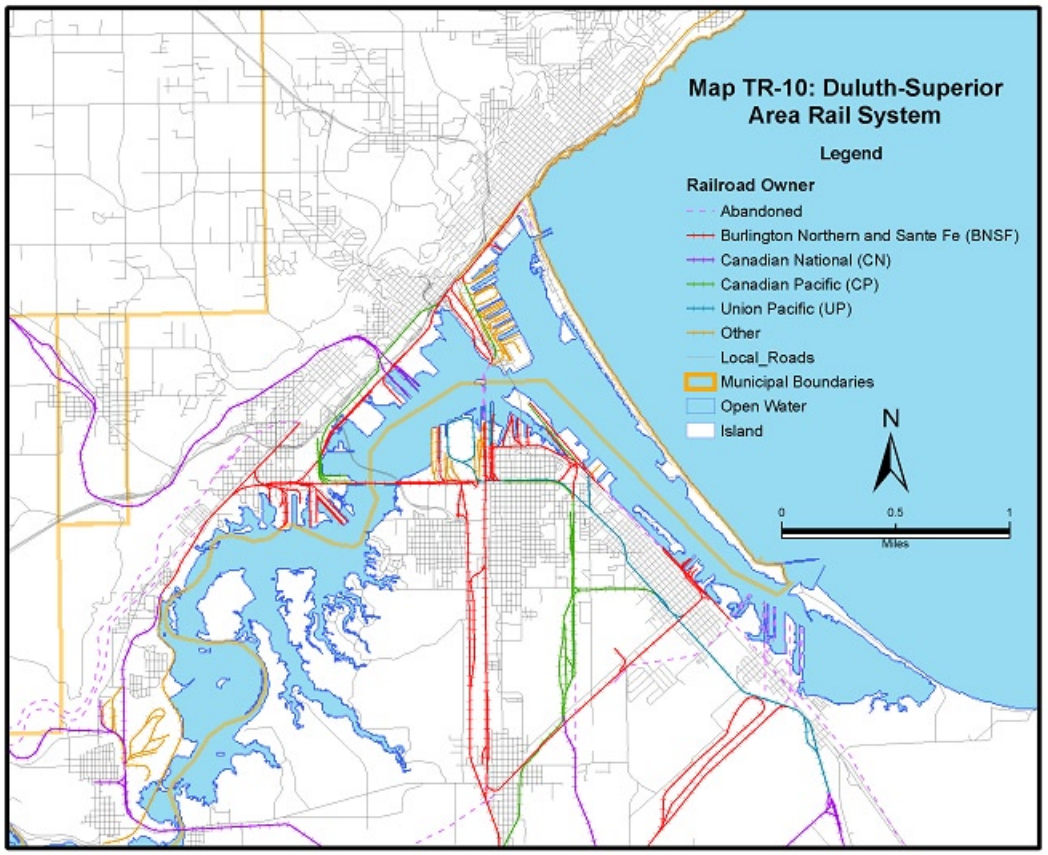
T20. Continue to work with the Seaway Port Authority, Army Corps of Engineers, Coast Guard, land owners and businesses, and resident stakeholder groups to maintain Duluth's shipping channels and intermodal port facilities (Transportation Implementation Examples Map #18.

A. Protect the viability of the shipping corridor through guiding appropriate land uses to, and restricting inappropriate uses from, sites with access to the channel,

B. Support decision-making processes that create environment- and community-sensitive solutions to dredging, water traffic conflicts, and water quality issues of ongoing port operation,

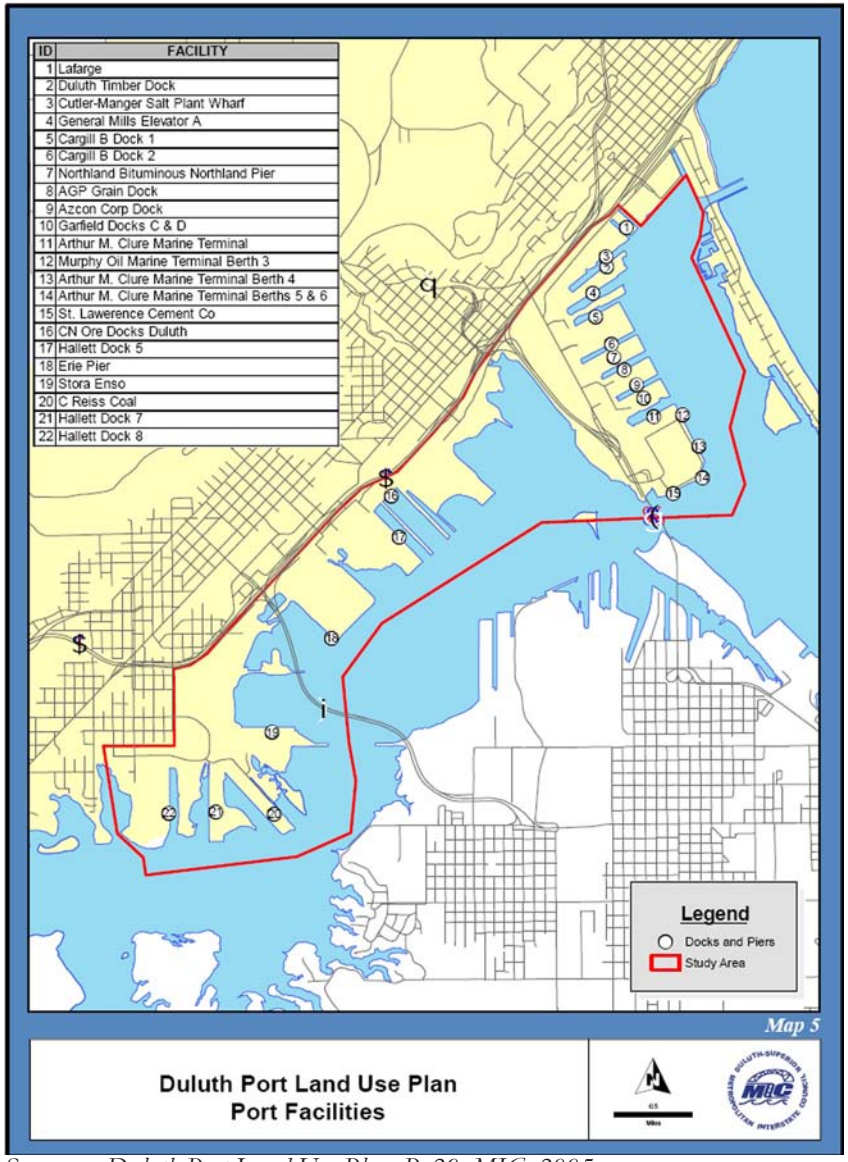
C. Plan for facilities that could be used for passenger transportation, including docking of a variety of vessel types and the intermodal considerations necessary for passenger travel.

Figure I-22: Duluth-Superior Railroads



Source: *Duluth-Superior Long Range Transportation Plan*, P. 191, MIC, 2005

Figure I-21: Port Facilities



Source: *Duluth Port Land Use Plan, P. 29, MIC, 2005*

T21. The City will continue to protect freight corridors and intermodal facilities that link water-borne shipping with rail and truck shipping. Investigate potential financial partnerships and land use issues for creating new intermodal facilities linking rail, truck, and port transportation.

T22. Continue to work with the Duluth Airport Authority to implement the Duluth International Airport Master Plan and the Duluth Airport Land Use Plan (#17 on the Transportation Issues Map). Proposed land uses around the airport should not conflict with the primary land use needs of the airport, including addressing the restrictions and recommendations associated with Federal safety zones and noise contours.

- **A.** Investigate rail connections to the Duluth International Airport and the potential for intermodal facilities to expand air freight markets and support industrial expansion.
- **B.** Improve the wayfinding system around Duluth International Airport to help air passengers and freight haulers access and use existing connections to the regional highway system.

Capital Improvement and Public Facilities

The Comprehensive Plan portrays the preferred mix of land uses at a point 20 years in the future. Achieving this mix of land uses does not, however, occur all at once. Development and preservation actions are strongly linked to market pressure, implementation of local land use policies, and availability of infrastructure capacity. In order to portray how the City should implement its future land use preferences over time, a conceptual development staging map was developed (Figure I-23) showing the preferred order of development rather than the preferred type of development.

The conceptual staging map was based on the following assumptions:

- Re-development and infill development is the City's top development priority, consistent with the Plan's **Principle #1 – Reuse previously developed lands**.
- The order of development should retain the integrity of the City's green infrastructure, consistent with the Plan's **Principle #2 – Declare the necessity and secure the future of undeveloped places** - including undeveloped lands being held in reserve until needed to meet demand for housing or commercial/industrial development.
- Development should occur in a manner that allows for cost-efficient investment and management of public gray and green infrastructure, consistent with the Plan's **Principle #12 – Create efficiencies in the delivery of public services**.

The conceptual staging map shows three staged development categories:

A. **Tier 1 -** Comprises the existing developed areas in the City (or previously developed areas) where gray infrastructure exists or can be easily extended.

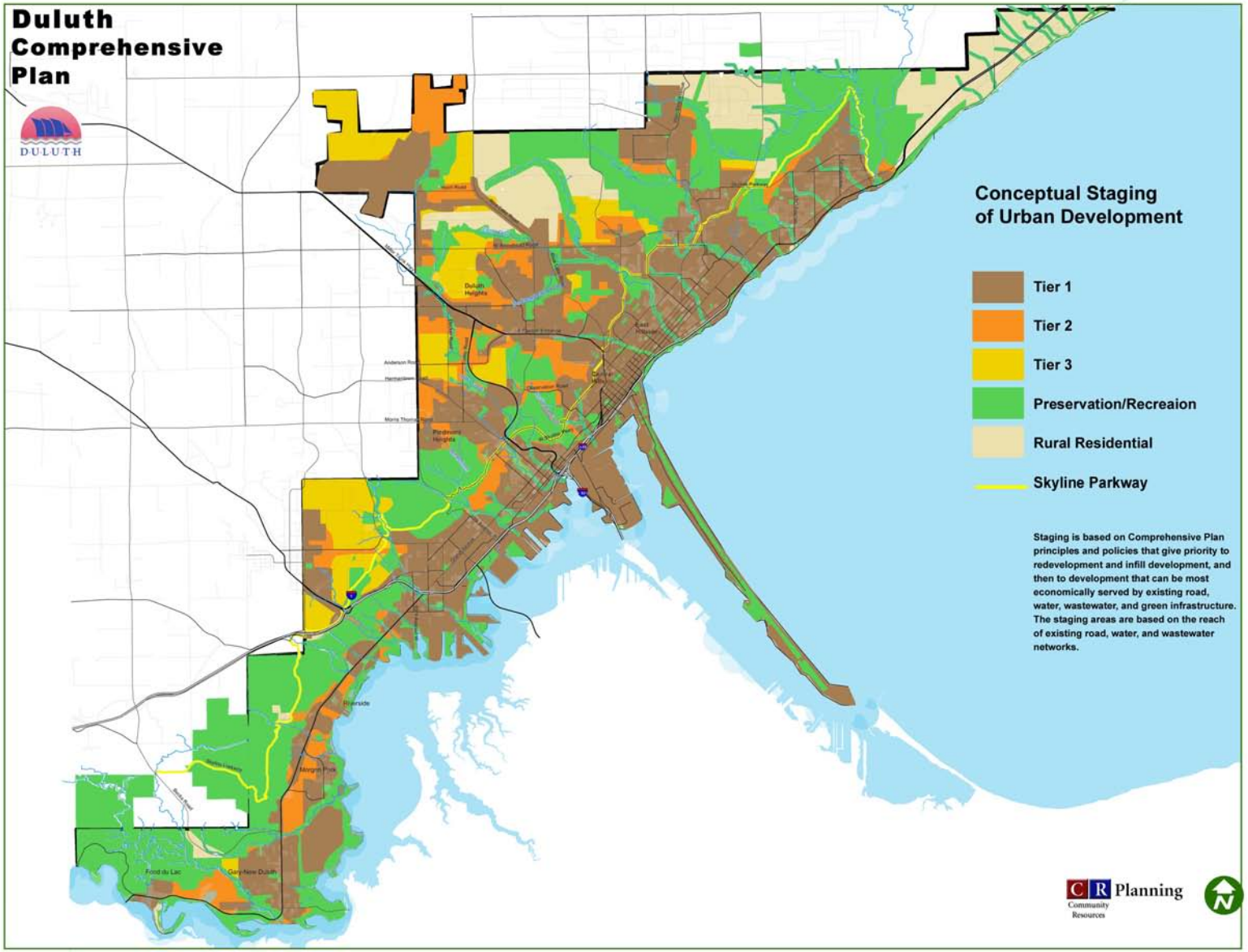
B. **Tier 2 -** Areas largely within existing service basins for water and wastewater services, and served by or close to the existing road network.

C. **Tier 3 -** Areas of the City that have been assigned a developed land use category on the future land use map, but are outside infrastructure and service basins and likely to require greater investment in public gray infrastructure in order for development to occur.

In addition to the three staged development categories, the staging map shows areas designated for development but not for the provision of most public services. These areas are designated as Rural Residential and will be developed consistent with conserving green infrastructure (using conservation design standards) as described elsewhere in the implementation section.

"Studies of Duluth tend to show that the chief present need from a city planning standpoint is not so much spectacular and expensive corrective measures, such as street widenings and openings, as the ability to control new growth along proper lines. This fundamentally is the purpose of a city plan."
Preliminary Major Street Plan and Transit Plan, City Planning Commission, Duluth, 1927, p. 1

Figure I-23: Conceptual Staging of Urban Development



The following conceptual facilities plan is based on the conceptual staging map, Plan policies, and the future land use map. The City will need to create clear tier standards, as described in the land use implementation section in order to provide additional guidance to future infrastructure decisions.

Conceptual facilities plan

Adequate infrastructure capacity, particularly of gray infrastructure systems, is necessary to meet staging goals of redevelopment, infill development, and protecting the integrity of the green infrastructure system. Furthermore, as neighborhood extensions reach the limits of existing water and wastewater service basins, larger public investments such as lift stations will become necessary to meet development priorities. These are significant planning issues that should be considered as the Comprehensive Plan is implemented.

The following section examines the potential ramifications of the conceptual staging plan on the need for new public infrastructure investments or better infrastructure management. This analysis is divided into three study areas that match the East, Central, and West Comprehensive Plan areas.

East planning area

North Shore - The farthest east end of the City, extending along the North Shore of Lake Superior, recently had water and sewer extensions completed as a result of failed on-site systems and contaminated drinking water supplies. The Western Lake Superior Sanitary District, planning with the City of Duluth, Lakewood and Duluth Townships, supported a project to supply wastewater collection to the rural east side of the City as well as portions of the townships east of Duluth. A new sanitary district, the Duluth/North Shore Sanitary District (D/NSSD) covers the City of Duluth from Lester River to the community of Knife River and from the Highway 61 expressway to the shoreline. This wastewater system utilizes individual grinder pump stations transmitting wastewater to a combination of pressurized and conventional gravity sewer with treatment at the Western Lake Superior Sanitary District in Duluth. Sufficient capacity is available in the system for continued growth in this area. The Duluth portion of the Sanitary District is, however, designated as Rural Residential on the future land use map. Protection of the North Shore green infrastructure - sensitive shoreline, recreation areas, and designated scenic viewsheds is inconsistent with urban densities and is the limiting factor for development within the D/NSSD service territory. The wastewater system will not, due to the Sanitary District ordinance, be extended above the expressway (Highway 61), an area that is also designated Rural Residential.

Gray Infrastructure Investments to Protect Green Infrastructure

Investing in new drinking water storage capacity in strategic areas will allow the City to better meet its infill and neighborhood extension staging goals. Encouraging investment in infill and neighborhood extensions helps direct development market pressure to areas already served by existing emergency services, recreational facilities, schools, and streets. Meeting infill and neighborhood extension goals also directs development pressure away from undeveloped areas where the green infrastructure systems are largely intact.

West of Lester River - In the upper Lakeside area the staging map shows Tier 1 and 2 areas between Seven Bridges Road and 42nd Ave. East. These areas will require additional water infrastructure to allow for residential infill (Tier 1) and neighborhood extension (Tier 2). The area is currently served by adequate water distribution lines but has pressure loss and total flow limitations that inhibit build-out scenarios. Fire protection and adequate storage capacities will require a water booster station and increase in existing storage capacity or additional sub-surface storage tanks.

This area has, in the past, seen wastewater collection system overflows and pump station bypasses that resulted in untreated wastewater flowing into Lake Superior. Both the WLSSD and Environmental Protection Agency placed restrictions on sewer extensions or development that would increase flows within these basins. Any private development project would have to include construction of a wastewater storage facility to divert flows for storage during a heavy rain or fast snowmelt condition. Due to the recent completion of two subsurface inflow and infiltration storage facilities and rebuilt pump stations, wastewater overflows in this area have been alleviated. The addition of this 2.2 million gallons of surge capacity will generally allow further infill development in the upper Lakeside area, consistent with the future land use map, without significant private investment in wastewater storage retention

The future land use map indicates development at urban densities (requiring centralized water and wastewater facilities) east of Arnold Road to Woodland Ave. This area is designated as Tier 1 and some Tier 2 development on the conceptual staging map. Sections of this area are currently serviced by individual septic systems and some individual drinking water wells. Municipal wastewater services are limited in this area and would require extensions of the wastewater collection system to support additional residential development.

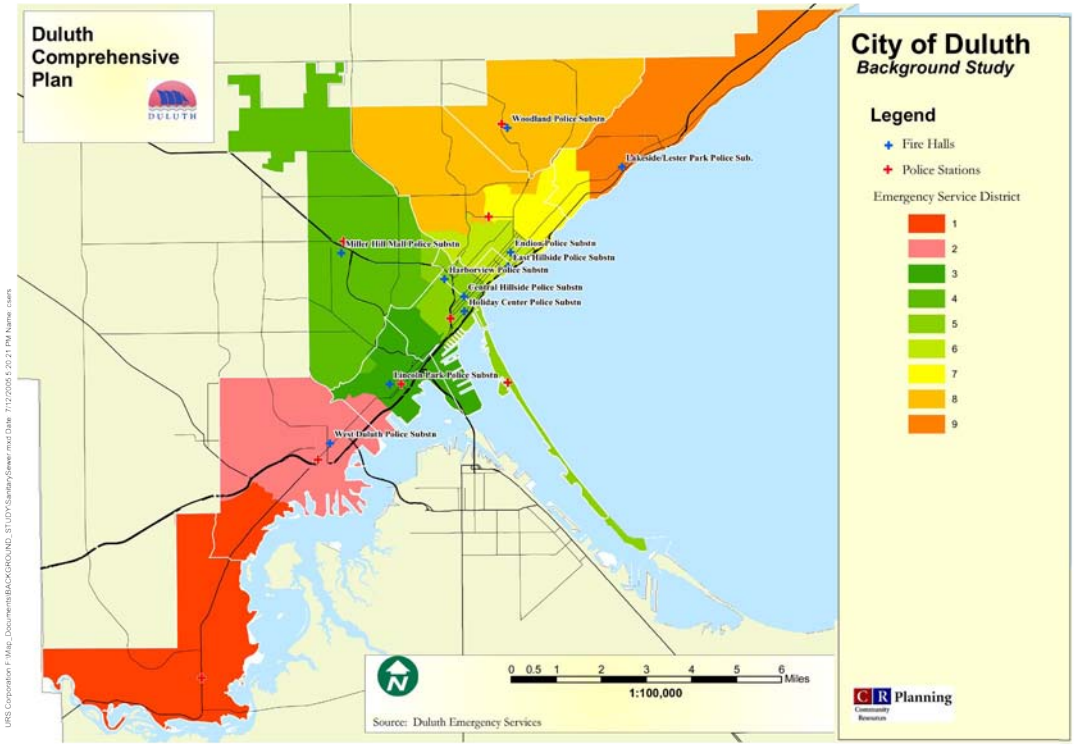
Drinking water is not as limited east of Arnold Road. Where water services are provided adequate pressure and capacity exists in most, but not all areas. The eastern edge of this area, designated as Tier 1, will require a water pressure boosting station and additional water storage. Comfort Systems (the City's water and gas department) has identified this improvement on its list of capital improvements (*Water System Potential Growth – 20 Year Plan*), calling for a new storage tank at Skyline and London Road between 2009 and 2013. This Tier 1 area will not, therefore, be ready for development in the near term unless the project is moved forward.

The Tier 3 areas within the Eastern section are generally easily served by wastewater service, but are limited for drinking water due to capacity limitations. The Tier 3 areas would require additional water storage and transmission investment in order to develop at urban densities. Comfort Systems does not have a plan to extend services to this area within its existing 20-year list of projects.

Emergency Services

The East planning area is served by three fire response areas and two police squad areas. The most remote and difficult to serve areas have been designated Rural Residential on the future land use map and are thus unlikely (if developed) to create substantial new burdens on existing emergency service capability and level of service. Access to some of the Rural Residential areas is, however, difficult and the geographic size of the existing squad and response districts is large, particularly in the City's North Shore area (east of Lester River). Some staging decisions may, therefore, need to be made in regard to Rural Residential development.

Figure I-24: Emergency Service Districts



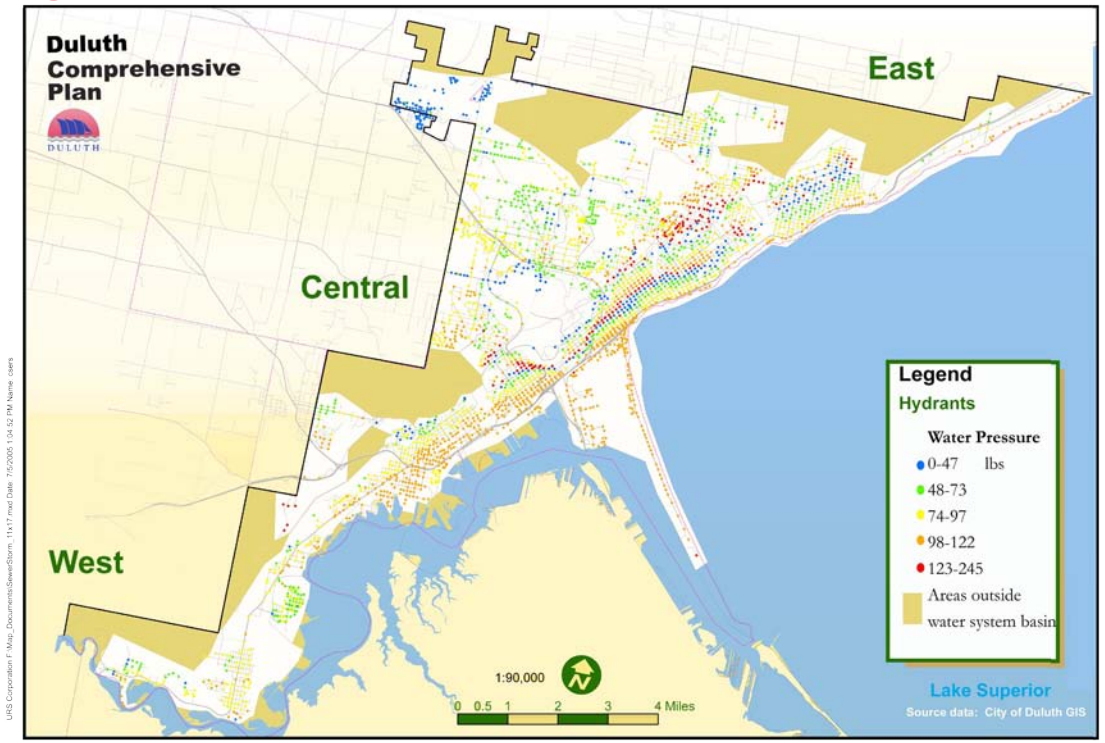
Central Planning Area

In order to meet the preferred mix of land uses shown on the future land use map for the Central Planning area, a number of extensive infrastructure improvements will be required. The Central area is the most densely developed area and also has the oldest infrastructure of the three planning areas. The existing wastewater collection system (the gravity mains and collectors) in much of the area is antiquated and suffers from inflow and infiltration (I&I) of clear water during times of snowmelt and heavy rain. Comfort Systems staff estimated the cost of rebuilding the older system to range between $53 and $75 million. Significant regular investment is needed to replace the existing pipes simply in order to support existing development.

In order to keep rates from increasing substantially, the rebuilding of the system must compete with investment needed to allow new Tier 1 and Tier 2 development elsewhere in the City, and

> "The fire department has placed fire stations in neighborhoods to quickly respond to areas where historically we have the most runs while still insuring an adequate response to the entire city. The fire department is participating in neighborhood meetings and looks forward to the comprehensive plan process. Completion of the comprehensive plan will require an assessment of future fire station staffing and location. Both are good tools to identify public safety needs."
>
> *Fire Department Service Review, 2004, p. 65*

Figure I-25: Water Pressure



storage capacity investments needed to reduce peak flows. Replacement of the pipes may not, however, address the capacity shortfalls described above.

Although significant strides have been made to alleviate the I&I problems, wastewater overflows and bypasses continue to occur at the Endion pumping station located at the bottom of 18th Avenue East and Water Street. The persistence of these overflows has prompted the City to continue with its program of building large I&I storage basins in priority areas. The Endion station is planned as next location for such a structure. Planned for completion in late 2007, the storage facility will provide capacity for additional development in the Central planning area.

Residential and commercial development identified on the future land use map in the 4th to 5th street area from approximately 12th Ave. E. to 6th Ave. W. is limited by isolated water pressure deficiencies – the pressure and capacity may not meet fire suppression requirements. Infill opportunities, particularly in the area of 1st Ave. E. and 4th Street where there is a cluster of fire hydrants with substandard pressure, may require public investment to increase pressure. Adequate pressure and capacity are in place just above (uphill from) this area to meet the City's infill development goals. Wastewater infrastructure is adequate both in term of dry weather capacity and for extensions into the planned development areas.

Some areas within the Central Planning area, such as North Road and Middle Road along Howard Gnesen Road, are described as Tier 1 development opportunities. These areas are 30 feet lower than the nearest wastewater pump station and would require a small diameter force main or the addition of another wastewater pump station in order to meet Tier 1 development goals. These solutions significantly increase both upfront capital costs and on-going maintenance costs, putting upward pressure on rates for the entire system.

The airport area has wastewater service but very limited water capacity and pressure available. Growth in the immediate Tier I development area will require significant water infrastructure up-grades in the form of booster pump stations and possibly a water storage facility. Special

provisions were made for the Cirrus Aviation group to meet the existing fire suppression codes, but would not be feasible for the remaining area.

The Tier 2 and 3 development areas north and east of the airport, delineated between Ridgeview Road south to Martin Road, are not serviced by water or wastewater infrastructure. Development in these areas would require pipe extensions to provide water and wastewater services. Water service to this area would be the most costly, requiring additional transmission lines as well as a booster pumping station and a water storage component. Moreover, some areas within this Tier 2 development area are more than 30 feet below the nearest sewage pumping station, thus requiring a small diameter force main solution or additional wastewater collection lines that would feed an additional wastewater pump station. Strategic site planning could avoid having to place additional lift stations in those areas.

In the Observation Road area, bordered by Trinity Road and East Central Entrance, there is a large area that currently has no water or wastewater utility service and has severe slopes and rock outcroppings preventing development to date. Development pressure to build high-end homes with a view has revived near-term interest in developing this area. Sections of the Observation Road area lie within Tier 1 and 2 developable areas. The City has discussed the installation of a water loop to assist in serving this area. Comfort Systems' long-range capital improvement plan identifies this improvement within the short term planning horizon.

The 20–year plan calls for a 6 inch to 16 inch water extension on Trinity Road from Home Depot to Anderson Road to Chambersberg Avenue in 2006. Bedrock at the surface and significant slopes has hindered the installation of infrastructure and consequent development in this area.

Tier 3 development opportunities in the Central area would require extensive water and wastewater infrastructure investments. The presence of bedrock outcrops and severe slopes create special challenges both from an engineering perspective and a financial one. Furthermore, the upper (northern) reaches of the Central area quickly exceed the 30 foot pumping requirement for wastewater transmission, and would require very long reaches of pipe.

Emergency Services

The Central planning area includes both the City's most densely developed areas and some of its most remote. Three police squad areas and five fire response areas (including partial areas) cover the Central planning area. The average response times for police and fire across this area reflect the breadth of topography and density. The large Tier 2 and 3 areas in the north

> "Much of Duluth is built on a hill. This increases response time and the need to have more stations – some located on the bottom of the hill and some on top. With Duluth's long winter road conditions, it is difficult to get to and work around buildings. While nothing can be done to change the terrain, recognizing the challenges and adjusting station districting allows for the best response time and protection of all areas of the city."
>
> *Fire Department Service Review, 2004, p. 35*

and northwest portions of the City present significant challenges for maintaining acceptable levels of service for emergency response. If these areas become fully developed, additional stations and equipment are likely to be needed, increasing not only capital bonding needs but annual budgets for staff and equipment. The Rural Residential areas in Fire Response Area 4 (west of Howard Gnesen Road) could also present service difficulties due to access and distance from existing fire halls and police stations.

West Planning Area

St. Louis River shore areas. Significant portions of land between 40th Avenue and 62nd Avenue West along the St. Louis River are designated as Tier 1 for urban development. As waterfront property, these areas are highly sought after for development, but exhibit challenges for utility extension. Currently, little of this area is served with water and wastewater utilities. The Tier 1 area is, furthermore, not contiguous, comprising separate peninsulas of land jutting out into the river. Traditional gravity sewer in this area would be cost-prohibitive and could require separate sections of interceptor pipes and corresponding pump stations. Depending on the number of homes or businesses in any one such peninsula of land, small diameter force mains may be utilized with individual grinder pump stations, but the total lift in feet to the existing interceptor lines may be a difficult engineering or cost barrier to overcome. Lines can be 'jack-bored' under sections of water line, allowing for a one line collection main with subsequent laterals to service individual homes.

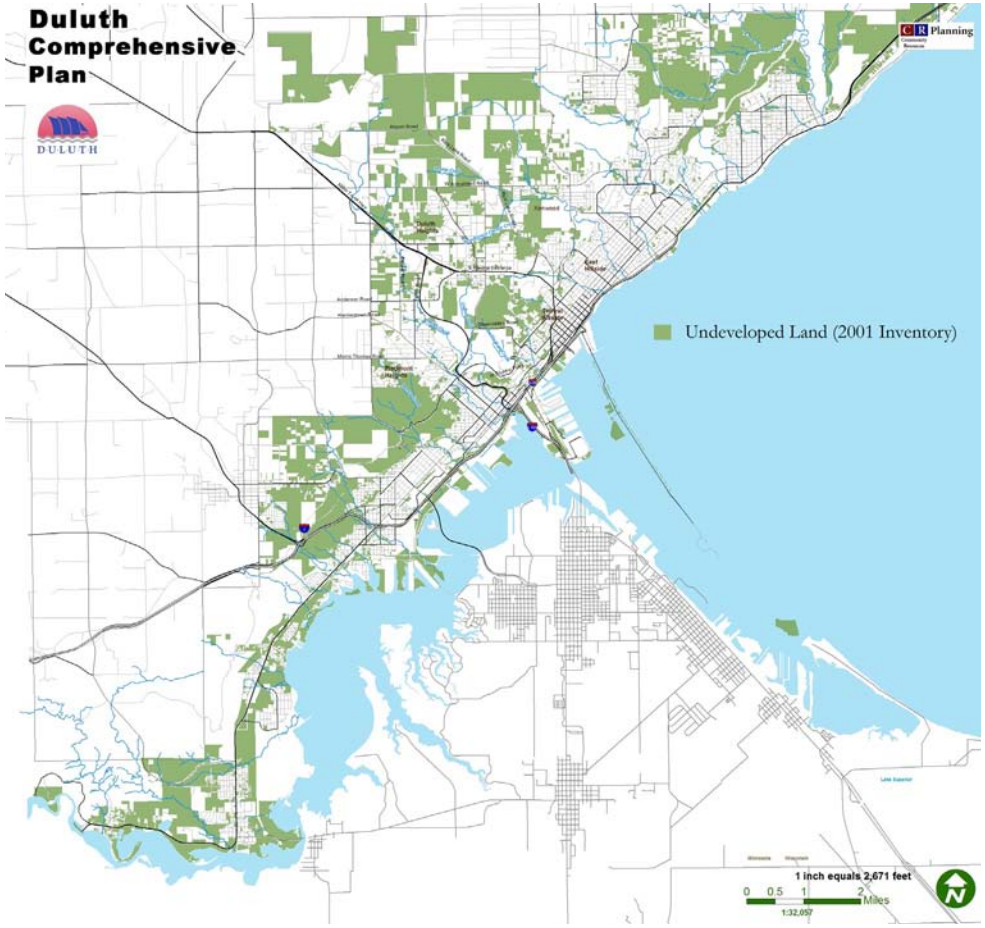
Comfort Systems' current policy is that the City will maintain, but not install small diameter force main systems that require individual grinder pump stations for each home or business. But the operation and maintenance of grinder pump stations and the laterals connecting a house to the main would be the responsibility of the homeowner or developer of the area. Homeowners or businesses are thus responsible for maintaining their wastewater infrastructure over time, similar to individual maintenance requirements for a septic system. The only exception to the City's policy is the small diameter system located in Fond-du-Lac neighborhood. This project was funded through State of Minnesota funds and as a requirement of these funds, operation and maintenance performed by the City. The North Shore region in the East Area also has a pressurized system with individual grinder pumps, but this system is operated and maintained by a third party, the D/NSSD, not the City. If the use of individual grinder pump stations and small diameter pressure mains continues as a wastewater collection solution, joint maintenance and operation is a possibility for the areas along the St. Louis River, but costs per household or per business would likely be substantial. Such areas might be served using the D/NSSD model (a separate sanitary district for the collection system),

if costs do not put development outside the range of market prices.

While water infrastructure is not readily available along the St. Louis River development areas, water service is less of an obstacle to development than in some other parts of the City. Being lower in elevation than existing water lines, gravity would feed individual developments along the shoreline. The water district in this area has adequate pressure and capacity already available, so water service would be relatively inexpensive compared to wastewater service. *The Water System Potential Growth – 20 Year Plan* calls for a new Arlington Reservoir and a new Highland Avenue tank to be built between 2009 – 2013, although the Arlington Reservoir project is being reconsidered.

St. Louis River Road to Proctor. The area adjacent to the City of Proctor, between the St. Louis River Road, Vinland Street, down through West Skyline Parkway to the Proctor City limits, includes Tier 1, 2, and 3 areas. Further development in this area would need to be examined carefully as the City of Hermantown has negotiated for sewer capacity with Western Lake Superior Sanitary District reducing the amount of capacity available for other expansion. The original intent of this up-graded interceptor was to alleviate over-capacity issues on Haines Road and divert wastewater flow further west. This plan corresponded with the City of Hermantown's three-phase wastewater collection system up-grades and extension plans. The total capacity allocation to the City of Hermantown, as well as the additional flow from the Pike Lake collection system may not leave much capacity for additional development along this interceptor within Duluth's city limits.

Figure I-26: Potential Greenfield Development Areas (2001)



Riverside to Fond du Lac. The conceptual staging map indicates there are considerable areas available to support higher density housing or commercial development from the Riverside neighborhood out through the Fond-du-Lac neighborhood. Wastewater infrastructure capacity in these areas is adequate to support new development since wet weather surge protection is provided by a one million gallon storm water storage facility located in Gary-New Duluth.

Water storage capacity and adequate pressure becomes a limiting factor for further development due to the area's location (far western fringes of the City). Water storage capacity limitations are particularly significant with regard to brownfield re-development opportunities for sites such as the vacant Atlas Cement facility and the U.S. Steel site located in Morgan Park. The latter site is designated as a mixed use redevelopment site that should include a diverse range of uses, from residential to light industrial. Both of these sites are problematic due to existing water pressure and capacity to meet fire protection needs. Water storage facilities as well as a water pressure boosting station would need to be constructed to meet pressure requirements. The large size of these areas can help to address water storage issues– a large master-planned redevelopment effort could provide sufficient private capital to justify new public infrastructure, if densities and market demand are both high enough to justify such a large investment.

Tier 3 development areas in Gary New-Duluth include challenging sections that are significantly higher in elevation than existing water lines and thus present pressure and capacity limitations. Wastewater additions are also complicated by the need to utilize grinder pumps and small diameter force mains already in use in this area. Additional grinder pump stations would be required and would create operation and maintenance issues for the City.

Emergency Services

The West planning area includes three fire response areas and two police squad areas. Response times are currently within acceptable parameters, but topography and access makes coverage for some outlying areas problematic. However, most of the Tier 2 and 3 areas do not expand the coverage area significantly, since coverage is already spread out along Highway 23 and adjacent to the City of Proctor. Emergency service staging issues are more likely to involve adequate staffing and equipping of existing facilities rather than creation of new stations. The greatest uncertainty for emergency services lies in the type and extent of large redevelopment areas, such as the U.S. Steel site, particularly if a significant cluster of homes or small businesses is developed on the site. Other potential new clusters of density, including sites such as those at the foot of Spirit Mountain or in Riverside's commercial waterfront area, could potentially create 'high risk" areas for fire response planning.

High Risk Areas

A few examples of high risk areas in Duluth are the business districts of downtown and Spirit Valley. Those areas have large structures that are side by side and need more firefighters and equipment to respond. While firefighters from outside those areas can respond to assist, the initial attack on these types of fires can be critical to containing the fire quickly and stopping the fire from spreading to another building.
Fire Department Service Review, 2004, p. 65

Capital Improvement Plan

The above analysis shows that the City will need to carefully evaluate infill and re-development priorities as they relate to capital expenditures and new infrastructure management

responsibilities. Development assistance, public investments in infrastructure, tax increment financing, and other incentives are available to meet the City's staging goals and follow the Comprehensive Plan Governing Principles. Areas that can be developed without having to invest in new infrastructure or take on additional maintenance responsibilities should be a top priority for the City. For instance there are vacant lots and dilapidated or abandoned structures within the City limits. Redeveloping unused, underused, or blighted sites would yield property with infrastructure and public services readily available, from utilities to streets, emergency services and recreation amenities. The public costs, if any, may be limited to the removal of old structures and any necessary remediation.

Urban infill areas and neighborhood extension areas within Tier 1 may need to be prioritized according to their locations relative to existing infrastructure. The further a specific development is from underground utilities, the higher the costs to provide services, both in primary construction and the associated operation and maintenance costs. Tier 1 developmental 'rings' could be delineated on a conceptual map that would outline a strategy for phased urbanization. Implementation priorities for the Tier/area include:

- Construction of I&I surge basins for the wastewater collection system, and continued abatement of I&I sources, will enhance service opportunities for existing neighborhoods and businesses while allowing further development within the City limits.
- Older wastewater and water systems must be rebuilt to maintain reasonable quality of service to existing developed areas; this can also provide incentives for infill and neighborhood extensions by building capacity into utility basins or districts designated for expansion on the future land use map.
- Continuing to improve the existing transportation systems, including the multi-modal road system, pedestrian rights-of -way, and trails, will expand capacity for infill and neighborhood extensions.

Neighborhood extensions and new neighborhoods in Tier 2, and virtually the entire area in Tier 3, will require the City to commit to substantial extensions of water and wastewater systems, and to consider when larger investments in pumping stations are justified. Adding to the existing road and trail network also increases the City's maintenance responsibilities and ultimate rebuilding costs. But the primary consideration in extending services into the Tier 2 and 3 areas lies in capitalizing water transmission infrastructure improvements. The financial investment and the magnitude of costs will dictate where urban-density residential or commercial development occurs.

"Duluth's shape has a major impact on the fire protection needs and cost. Most modern cites are relatively square with streets and utilities in a grid pattern. Duluth's shape not only increases the cost of our infrastructure, it also increases the number of fire stations necessary to provide a timely response to all areas of the city. A community similar in population and smaller in size might require fewer fire stations."

Fire Department Service Review, 2004, p. 35

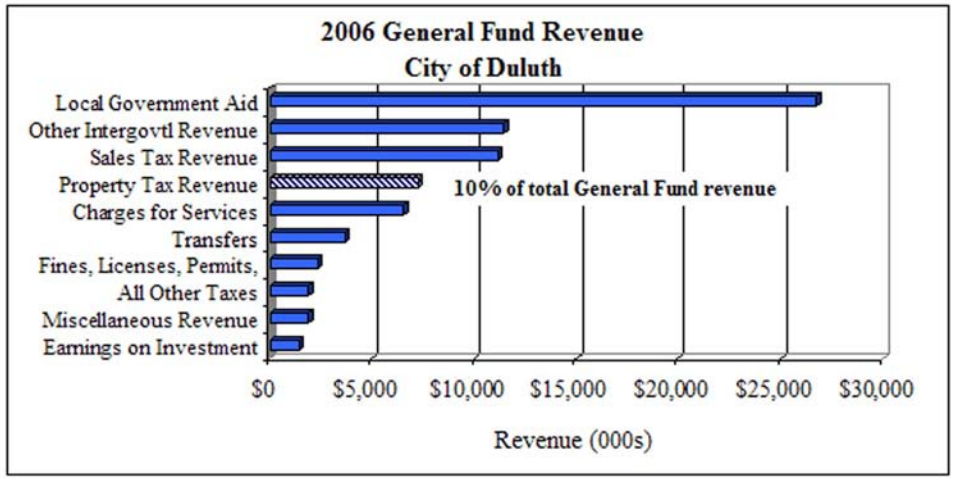
The City has some capacity for more detailed hydraulic modeling in order to better link development staging and infrastructure expansion. An evaluation of the hydraulic water model will also need to take place, as this data will directly affect plans for infill. The software, called EPA-NET, is a network analysis tool with the capability to compute water distribution pressure and flow differentials throughout the City, using different variables.

Capital and maintenance costs

Development requires both new infrastructure and maintenance of infrastructure over time. While property taxes generated from development support some of the ongoing costs of maintenance and repair, property tax revenues are unlikely to wholly support the ongoing infrastructure maintenance and rebuilding costs faced by the City. The following outlines some of the financial implications of adding new infrastructure to meet staging goals outlined in the Comprehensive Plan.

- A wastewater lift station ranges in cost from $180,000 to $220,000 (in 2006 dollars), depending on the sophistication of the electronic equipment installed into the station. This includes the telemetric, skada systems and controls (remote and manual) installations.
- A drinking water booster station ranges in cost from $250,000 to 300,000. The additional costs are due to the increased mechanical and pump requirements to maintain needed water pressures.
- Wastewater pumping stations ranging in cost from $150,000 to $250,000. Electricity for pumping is a major operating expense for both the water and wastewater systems. Adding additional infrastructure adds costs not only for the initial construction but for annual maintenance and accounting for depreciation (rebuilding). Duluth's topography does not lend itself to a philosophy of reducing utility fees by encouraging development in green field locations.
- The average annual cost per mile of street for snow plowing and routine maintenance is approximately $11,000, in 2006 dollars, (excluding street sweeping and stormwater related maintenance). These costs are incurred regardless of the number of homes or business located along the street.

Figure I-27: 2006 General Fund Revenue Sources



- Emergency services (police and fire departments) constitute 40% (2006) of the city's expenditures. The 2004 budget for police services was over $12 million, while fire services cost almost $10 million, excluding pension costs and other costs ultimately paid by the State of Minnesota. The distribution of homes and businesses has a significant impact on the cost of providing services, and the effectiveness of services as measured in terms of response times. Building and staffing new fire and police stations is much more expensive than adding staff or equipment to existing stations (the analysis of marginal costs to compare these scenarios is quite complex).

The following chart demonstrates the range of costs for discrete kinds of projects, based on historic data for similar projects in Duluth. The costs have been adjusted to 2006 dollars.

Figure I-28: Gray Infrastructure Capital Costs

Gray Infrastructure Capital Costs										
	(1) (2)	INFRASTRUCTURE COMPONENTS								
Project Description	Cost / Lin. Ft.	Urban Bituminous Street	Urban Concrete Street	Watermain & Hydrants	Water Services	Sanitary Sewer & MH's	Sanitary Services	Storm Sewer & MH's	Storm Leads & CB's	Gas Main & Services
Local Street Reconstruct	$290	X			O		O		X	
Local Street Reconstruct (With Water)	$355	X		X	X		O		X	
Local Street Reconstruct (Water, Sanitary)	$410	X		X	X	X	X		X	
Local Street Reconstruct (Water, Sanitary, Storm)	$465	X		X	X	X	X	X	X	
Local Street Reconstruct (Water, Sanitary, Storm, Gas)	$490	X		X	X	X	X	X	X	X
Rural to Urban Street Reconstruct	$340	X		O	O	O	O	X	X	O
Rural to Urban Street Reconstruct w/Rock	$375	X		O	O	O	O	X	X	O
New Local Street (Water, Sanitary, Storm, Gas)	$450	X		X	X	X	X	X	X	X
New Local Street (Water, Sanitary, Storm, Gas, w/Rock)	$500	X		X	X	X	X	X	X	X
State-Aid Collector Street Reconstruct	$375		X		O	O	O	O	X	
State-Aid Arterial Street Reconstruct	$400		X		O	O	O	O	X	
Watermain Reconstruction Local Street	$85	O		X	X					
Watermain Reconstruction Local Street w/Rock	$105	O		X	X		O			O
Watermain Reconstruction State Aid Street	$100		O	X	X					

Gray Infrastructure Capital Costs										
	(1) (2)	INFRASTRUCTURE COMPONENTS								
Project Description	Cost / Lin. Ft.	Urban Bituminous Street	Urban Concrete Street	Watermain & Hydrants	Water Services	Sanitary Sewer & MH's	Sanitary Services	Storm Sewer & MH's	Storm Leads & CB's	Gas Main & Services
New 2" HDPE High Pressure Gas Main	$25									X
New 3" HDPE High Pressure Gas Main	$30									X
New 6" HDPE High Pressure Gas Main	$75	O								X
Sanitary Sewer Trenchless Rehabilitation	$65					O	O			
Sanitary Sewer Reconstruction	$85	O				X	X			
Sanitary Sewer Reconstruction w/Rock	$105	O			O	X	X			O
New Sanitary Sewer Extension	$95	O				X	X			
New Sanitary Sewer Extension w/Rock	$135	O				X	X			
	O	Partial Replacement, Upgrades, or Restoration								
	X	New or Complete Replacement								

Notes:

1) The Cost Rate is shown in terms of Dollars per Linear Foot of the improvement along the length of the corridor. The cost rate shown includes: construction costs, design/construction engineering, and city administration of project. This cost rate does NOT include operations and/or maintenance costs, but does demonstrate a budget cost to the City for each category of public infrastructure improvement.

2) Costs are based on 2006 Construction Dollars

3) MH = manhole, CB = catch basin