November 2018

Environmental Analysis
Minneapolis 2040 Plan

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Exhibit 1

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I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a Duly Licensed Professional Engineer under the Laws of the State of Minnesota.

Kirsten Pauly, PE

November 29, 2018
Date

21842
MN Registration No.

Exhibit 1

1.0 Executive Summary

The revised draft of Minneapolis 2040 (2040 Plan) was released in the Fall 2018. The 2040 Plan establishes a dramatic shift in land use policy with a general city wide increase in permitted density. Proposed changes in land use consistent with the 2040 Plan and policy inherently impact the environment as well as existing infrastructure that was implemented based on entirely different design criteria.

The 2040 Plan has not included a thorough evaluation to identify environmental impacts that are a likely result of the adoption of the 2040 Plan. Without such evaluation, the specific criteria for mitigating likely adverse environmental impacts cannot be identified or incorporated into the regulating document.

Typically, development projects are subject to mandatory thresholds for environmental review. Successful environmental review first identifies whether or not there are aspects of the proposed project that are likely to cause environmental impacts and then establishes specific mitigation for minimizing or eliminating impacts before any project approvals can be considered. Environmental review provides an opportunity for the development of proactive mitigation measures that may guide and inform the ultimate nature of a project prior to approval.

This report provides a review of some topics of environmental impact likely to result from adoption of the 2040 Plan. The report does not attempt to address all areas of environmental concern. Typical environmental review encompasses a more detailed analysis of issues and addresses a much broader number of topics of concern.

Other projects conducted within the state that propose a fraction of the magnitude of change contemplated by the 2040 Plan are subject to environmental review. This is because they exceed mandatory environmental review thresholds and inherently represent an increased risk of causing significant environmental effects. The 2040 Plan is no exception. The magnitude of physical impact to the environment resulting from the 2040 Plan is likely to cause pollution and impairments to the environment. The 2040 Plan lacks both an identification of these impacts and specific design criteria which could be utilized as a means of mitigating or reducing likely adverse environmental effects.

2.0 Project Magnitude data

To illustrate that the 2040 Plan will induce development in a manner that is likely to cause direct or indirect physical manipulation of the environment, project magnitude data was evaluated for comparison with the Environmental Impact Statement (EIS) Mandatory Thresholds for residential development.

Minn. Rules 4410.4400 establish mandatory Environmental Impact Statement (EIS) categories. Minn. Rules 4410.4400 subp. establish a threshold test for each mandatory category. An EIS must be prepared for projects that meet or exceed the thresholds established in the Rule.

When evaluating project magnitude data for phased residential development, Minn. Rules require that the total number of potentially buildable units are included in the threshold analysis regardless of whether or not the whole area is proposed for immediate development[1]. When specific development plans are not available, the number of potentially buildable units is calculated from the maximum allowable units per acre, or if the ordinance does not specify, from the average number of units per acre from the area as planned, multiplied by the number of acres. If the total potential number of units exceeds a mandatory threshold, review is required for all phases.

The 2040 Plan magnitude data was developed in this manner.

2.1 Residential Development Mandatory EIS Category

Minn. Rules 4410.4400 subp. 14 establish the threshold for mandatory EIS for the residential development category. The threshold for mandatory review of residential developments that propose the construction of a permanent or potentially permanent residential development is 1,000 unattached units or 1,500 attached units. In accordance with Environmental Quality Board (EQB) guidance, single family, duplex and triplex units are considered unattached while four or more units to a building are defined as attached. Each individual dwelling unit counts as one unit; therefore, a 24-unit apartment building equals 24 attached units.

2.2 Anticipated New Units – Based on projected growth

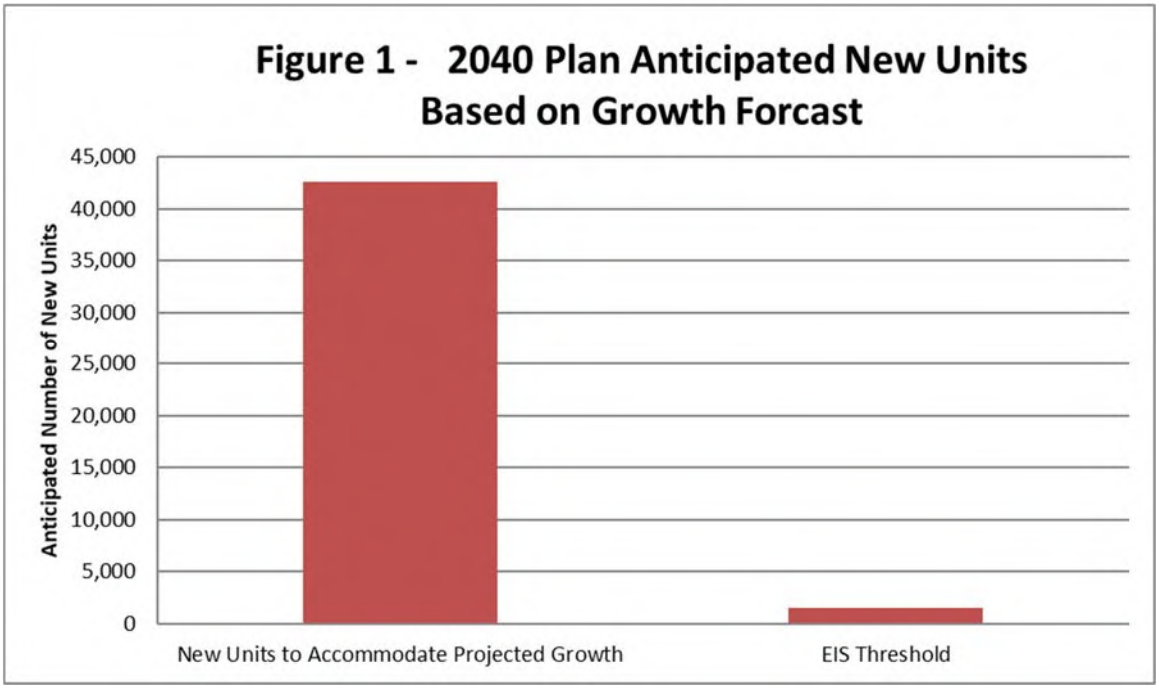
One threshold density calculation was performed for new residential units in ten year stages using data included in the 2040 Plan (Appendix B Figure 3-1 Land Use Table in 10 Year Stages)[2]. New residential units to accommodate growth projections were calculated based on the increase in acres of each land use allowing residential development, multiplied by the average of the typical density range (dwelling units (du) per acre). The results are presented in Table 1. The average of the reported typical density range from the 2040 Plan is presented below. Calculations of the anticipated new residential units based on the maximum and the expected growth density were also performed and included in Attachment 1.

[1] Minn. Rules 4410.4300 subp. 19 and Minn. Rules 4410.4400 subp. 14.

[2]Minneapolis 2040 Revised Draft with Appendixes, undated - released Fall 2018 - Appendix B Table 3-1 Land Use.

Table 1 - Projected New Residential Units Based on Anticipated Growth			
	By 2020	By 2030	By 2040
Projected New Residential Units	12,590	25,048	42,630
Mandatory EIS Threshold (Units)	1,500	1,500	1,500

The results of this calculation illustrate that during every stage of development, the mandatory EIS threshold is exceeded. However, the calculation essentially just illustrates new housing units required to accommodate the City's projection of population growth and the expected growth within various land use categories. Figure 1 compares the number of new units expected to meet growth forecasts compared to the EIS mandatory threshold for residential development.



It should be noted that the above calculation is conservative as the total expected number of residential units by 2040, based on other information included in the 2040 Plan (Figure 4-1 of Appendix B Fall 2018 Draft) is 48,908 new units, as illustrated on Table 2 below.

Table 2 - *Anticipated* New Units 2040 Plan		
New Units	**DU/Acre**	**Future land use category**
8,163	37.19	Urban Neighborhood
93	29.04	Neighborhood Mixed Use
4,525	59.91	Corridor Mixed Use
18,934	122.51	Community Mixed Use
6,755	136.15	Destination Mixed Use
9,454	1,704.74	Public, Office and Institutional
984	23.72	Production Mixed Use
48,908	***Total New Units***	

This initial calculation fails to determine the number of *potential* residential units resulting from the adoption of the 2040 Plan. The 2040 Plan does not limit development within any land use category or in accordance with growth projections. The 2040 Plan allows for substantially greater number of residential units to be built than is needed to accommodate projected population growth and some areas of the city may experience dramatic growth.

2.3 Potential New Units – Based on allowable units per acre

In accordance with environmental review guidance, potential buildable units are calculated from the maximum allowable units per acre, or if the ordinance does not specify, from the average number of units per acre from the area as planned, multiplied by the number of acres. If the total potential number of units exceeds a mandatory threshold, review is required for all phases.

Table 3 illustrates the typical range, average of the typical range, and expected growth density for each future land use category presented in the 2040 Plan[3]. The average growth density was used to calculate potential new residential units, although the 2040 Plan notes that it is not inconsistent to build at higher densities.

[3] 2040 Plan undated Fall 2018 Draft Appendix B Land Use

Table 3 - Typical Range, Average and Expected Density (from 2040 Plan)			
Land Uses Allowing Residential Development	**Typical Density Range (du/acre)**	**Average Density (du/acre)**	**Expected Density (du/acre)**
Urban Neighborhood	8-40	24	37.19
Neighborhood Mixed Use	8-40	24	29.04
Corridor Mixed Use	8-75	41.5	59.91
Community Mixed Use	12-125	68.5	122.51
Destination Mixed Use	75-150	112.5	136.15
Production Mixed Use	15-25	20	23.72
Public Office and Institutions	8-175	91.5	170.74

The following analysis is limited to the potential new residential units in the ***Urban Neighborhood*** future land use category. This is the largest future land use category in terms of size, encompassing nearly 50% of the city. The approximate acres of low density residential parcels (those parcels currently zoned R1, R1A, R2, and R2A) that will be in the Urban Neighborhood future land use category was calculated[4].

The potential increase in residential units was obtained by determining the difference between the number of currently permitted dwelling units and the number of future permitted dwelling units. The number of future permitted dwelling units is based on the average of the typical range that is included in the 2040 Plan[5]. Potential new units were determined by applying the difference between the average density and the currently permitted density over the number of acres of existing low density residential land use that will be in the Urban Neighborhood future land use category. The results are summarized in Table 4 and Figure 2.

The estimate of the number of potential new residential units within the Urban Neighborhood future land use category is conservative because it does not use the maximum permitted density or the expected growth density that is included in the 2040 Plan, both of which would yield more units. It also uses a conservative number of acres in the Urban Neighborhood future land use district as a basis for the calculation.[6] Using the

[4] Non-residential parcels, such as churches and parks were excluded to the extent practical. It is reasonable to assume that these non-residential uses will remain.

[5] 2040 Plan undated Fall 2018 Draft Appendix B Land Use

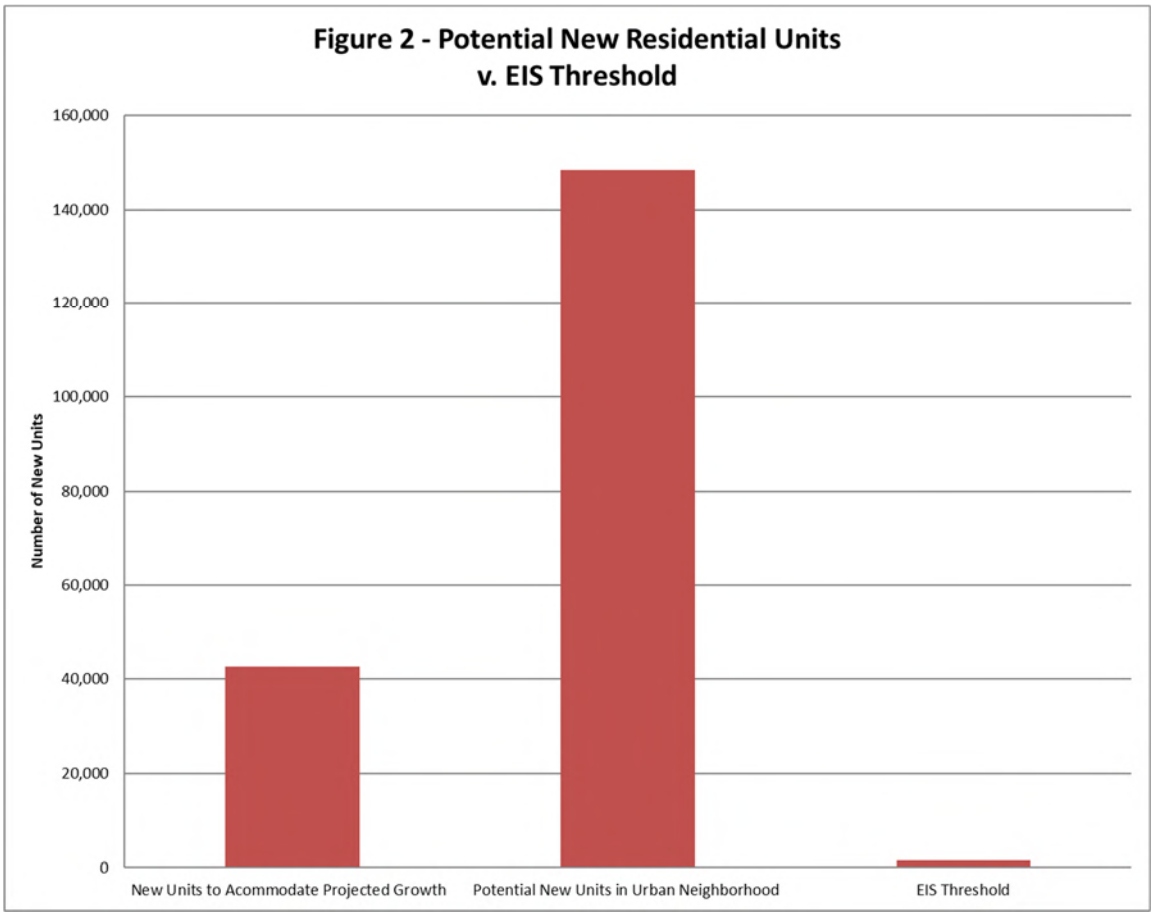
[6] The calculation is based on a total of 11,300 acres of existing low density residential converting to Urban Neighborhood future land use. The 2040 Plan indicates that there are 12,139.78 acres of existing low density, and 14,095 acres of Urban Neighborhood in 2040. Our calculations, which did not include parks, schools or other obvious nonresidential uses resulted in approximately 11,544 acres or current low density residential converting to Urban Neighborhood future land use. Because of last minute revisions to land use categories by the city that could potentially affect this number ,a conservative total of 11,300 acres was used.

expected density of 37.19 du/unit increases the number of potential new units to 297,436 (Attachment 1).

Table 4 - New Residential Units in Urban Neighborhood Future Land Use Category based on expected growth density						
Current Zoning District	Acres in UN[a]	Existing permitted density (du/acre)	Current permitted (du) [b]	Future permitted avg density (du/acre)	Future (du)	Potential New Units (du)
R1/R1A	8,700	8.71	74,03.5	24	204,000	129,965
R2/R2B	2,800	17.42	48,776	24	67,200	18,424
Total	11,300		122,811		271,200	**148,389**

[a]UN = Urban Neighborhood future land use category

[b] Based on min lot size see Table 5



Increased residential density resulting in an increase in potential residential units is not limited to the Urban Neighborhood future land use category. There are six other future land use categories that allow residential development. Some existing low density residential

parcels will be guided to Neighborhood Mixed Use, Corridor Mixed Use, Community Mixed Use, etc. These other future land use designations are associated with different net densities (see Table 3) and represent an even greater number of potential residential units permitted by the 2040 Plan. In general, the 2040 Plan allows for higher densities in every future land use category.

The area of induced development as a result of allowable increased density within the Urban Neighborhood land use category encompasses approximately 45% of the City of Minneapolis. The magnitude of allowed and encouraged development within this one future land use district alone demonstrates a physical manipulation of the environment, directly or indirectly, on almost half of the land within the City of Minneapolis. Figure 3 illustrates the extent of the area affected by the densification of the Urban Neighborhood future land use category.

Direct and indirect impacts that are likely to be caused by the increased density allowed in the 2040 Plan are discussed in the following sections. This is not intended to be an exhaustive list but serves to illustrate some areas of likely impact to air, water or other natural resources that have not been identified or mitigated in the 2040 Plan.

3.0 Land Use:

The 2040 Plan results in large magnitude changes in land use. Increased density, use and scale resulting from the implementation of the 2040 Plan is likely to materially adversely affect the environment.

3.1. Summary of Land Use Issues

1. Land use impacts have not been adequately analyzed, identified, or mitigated within the 2040 Plan.

2. Minneapolis will likely experience continued housing and employment growth. Future growth is anticipated to occur as guided and encouraged by the comprehensive plan policies. This will result in changes to current land use patterns that will occur over time.

3. Permitted changes will result in intensification of density, use, and scale on a city-wide basis.

4. Denser and more intensive housing and commercial development will be permitted primarily in the existing low density residential zoning districts.

5. The most significant impacts will occur in areas currently characterized by relatively low density that are guided to more intensive density.

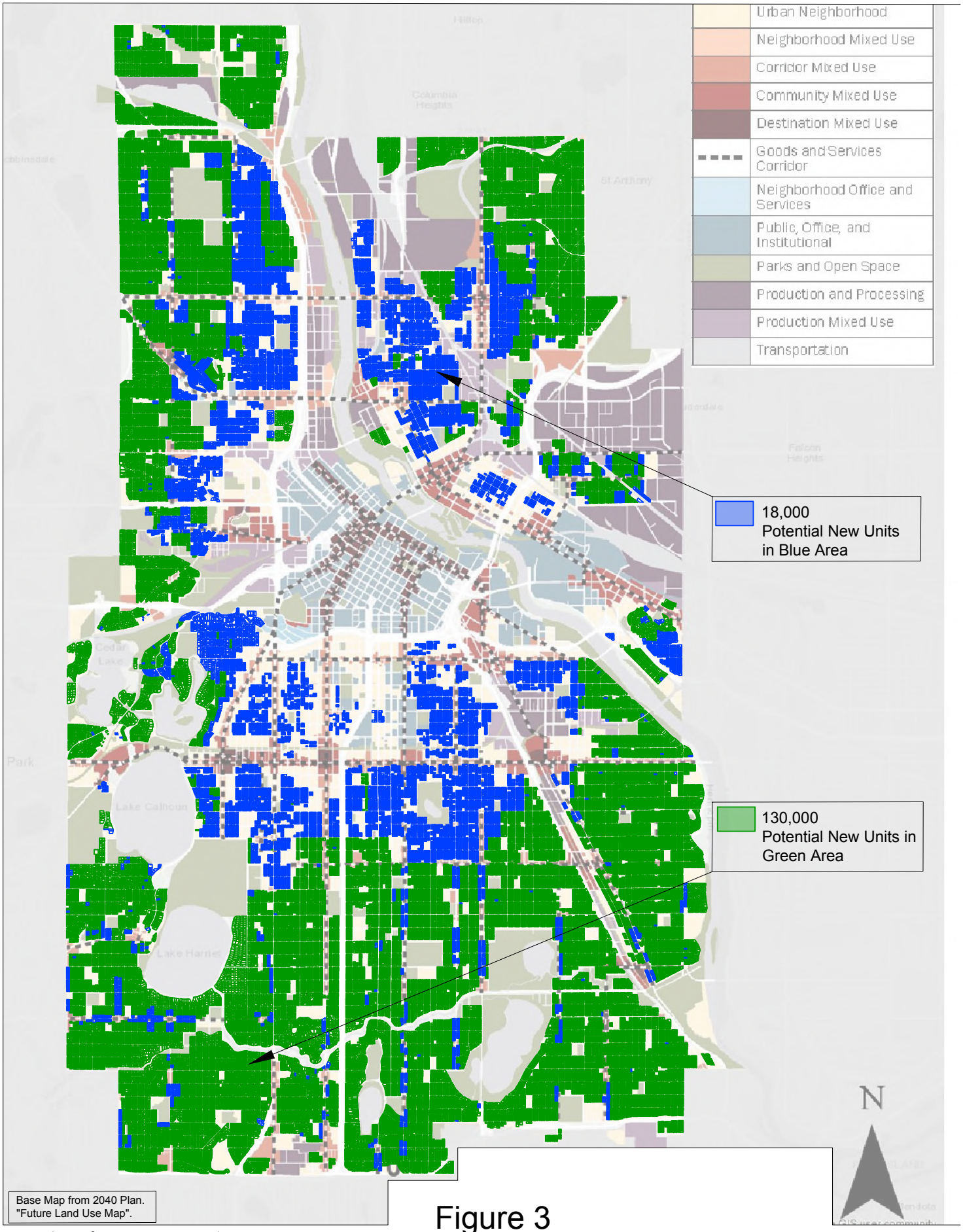


Figure 3

Number of New Units Based on Average of Typical Density

Existing Low Density Residential to Urban Neighborhood
Location of Potential New Residential Units

Exhibit 1

6. Other zoning districts may experience land use impacts as well, as the 2040 Plan generally moves towards greater densities and scales in all land use areas, however the magnitude of those impacts will not be as great.

7. The current Minneapolis zoning code describes low density residential as the R1, R1A, R2, and R2B zoning districts.

8. The 2040 Plan indicates that there are currently 85,508 parcels of low density residential land use.

9. The 2040 Plan indicates that low density land use currently encompasses 12,139.78 acres, or 49.73% of the City of Minneapolis[7].

10. The current net density for the existing R1 and R1 residential land use is approximately 7.18 du/acre. The current net density for R2 and R2B residential land uses is approximately 14.11 du/acre. These estimates are based on existing low density residential parcels with current residential land uses. Existing net density is lower than permitted net density because some parcel sizes are larger than the minimum requirements. Table 5 summarizes permitted and expected residential densities.

Table 5 - Existing and Permitted Net Density Low Density Residential

Current Zoning	Acres	Parcels	Permitted du/parcel	Permitted Dwelling Units	Existing Net Density (du/acre)	Permitted Net Density (du/acre)	Expected Density Urban Neighborhood
R1/R1A	8,777	63,034	1	63,034	7.18	7.26-8.71	37.19
R2/R2B	2,965	22,021	2	41,842	14.11	14.52-17.42	37.19

11. The majority of low density residential parcels will be within the Urban Neighborhood future land use category. The expected density for the Urban Neighborhood land use category is 37.1 du/acre.

12. The 2040 Plan indicates that it is not inconsistent with the plan to have greater densities then the expected densities

13. Approximately 8,700 acres with permitted net densities of 7.26 to 8.71 du/acre, based on minimum allowed lot sizes, will be guided to Urban Neighborhood future land use category, with an expected growth density of 37.19 du/acre.

[7] 2040 Plan Appendix B Land Use Table of Existing Land Use Acres

14. This results in a potential increase in density of over four times the current permitted density for R1 and R1A lots. This impact effects approximately 35% of the City.

15. Approximately 2,800 acres with permitted densities of 14.52 to 17.54 du/acre based on minimum allowed lot sizes will be guided to Urban Neighborhood future land use category, with an expected growth density of 37.19 du/acre.

16. This results in a potential increase in density of over two times the current permitted density of R2 and R2B lots. This impact effects approximately 12% of the City.

17. Approximately 47% of the City of Minneapolis will be impacted by the resulting intensification of density, intensification of use, and intensification of scale that is permitted and encouraged in the Urban Neighborhood future land use category under the 2040 Plan.

18. Other future land use categories will be guided to increased density but were not addressed in this report.

3.2 Environmental impacts relating to land use resulting from intensification of density, use and scale:

Proposed changes to land use result in a substantial increase in development intensity (allowed density or building height) and will permit new land uses not allowed under current zoning (e.g., low density residential use to medium or high density residential or commercial uses).

Significant environmental impacts result from the change in land use and built forms. These impacts are the result of intensification of density, intensification of use, and intensification of scale established in the 2040 Plan. Likely impacts include:

1. Increased noise impacts;
2. Increased pedestrian traffic;
3. Increased vehicle traffic;
4. Increased vehicle congestion and idling;
5. Decreased air quality;
6. Increased parking constraints;
7. Negative impacts to existing viewsheds (landmark buildings, open spaces, water bodies);
8. Longer hours of activity;
9. Reductions in privacy;
10. Increased light and glare from buildings.
11. Greater impacts from construction if construction of larger buildings than previously permitted increases the duration of construction activity;
12. Decreased access to light for surrounding properties;

13. Shadowing of adjacent properties; and
14. Impacts to existing solar panels on neighboring structures.

3.3 Analysis of Intensification of Density, Use and Scale

This section analyzes the effect of the 2040 Plan on density, use and scale. Land use impacts are not limited to the examples given below but represent the area of greatest impact. Impacts are not necessarily limited to the land within the reguided area. There is potential for conflicts and changes in character at the edges of areas with a significant land use change. Areas where greater intensity development abuts lower intensity development create potential land use impacts as well.

3.3.1 Intensification of Density

Residential density increases occur when density limits in the land use plan are changed or removed altogether allowing a property of a given size to have more housing units. Land use impacts may occur from an increase in the allowed density of activity on a lot or site. The 2040 Plan results in allowed density increases on all existing low density residential districts (R1/R1A and R2/R2B). The allowed density increases from one or two dwelling units (du) per lot to at least three du/lot and some of the existing low density lots are in built form districts with no density limits at all.

Figure 4 Expected Growth Density by Built Form District Excerpt from 2040 Plan Appendix B

Future Built Form Category	New Units	DU/Acre
Interior 1	1,214	10.17
Interior 2	1,618	18.08
Interior 3	2,427	22.60
Corridor 4	2,832	31.91
Corridor 6	3,113	36.09
Transit 10	6,472	69.84
Transit 15	4,245	97.70
Transit 20	9,200	145.20
Transit 30	13,327	217.80
Core 50	4,460	181.50
Production	-	0.00

Note: These numbers represent expected prevailing future residential density for new development in the identified land use and built form districts. It is not inconsistent with the policies in this plan to build at residential densities greater than those identified in this table.

Minneapolis does not regulate maximum density based on du/acre. However, the 2040 Plan includes expected typical density ranges for the different built form districts. The 2040 Plan indicates that building at residential densities greater than the typical range presented is not inconsistent with the policies of the 2040 Plan. The built form districts guide the scale of development for every parcel in the city regardless of the underlying land use category. The built form of all new and remodeled buildings must be consistent with the guidance of the built form map.

Table 6 presents an estimate of the increase in residential density for existing single family R1/RA lots based on proposed built form districts. The table presents the increase in density that is consistent with the policies of the 2040 Plan for the main built form districts that the current single family zoning districts will be located in (Interior 1, Interior 2, Interior 3, Corridor 4 and Corridor 6[8]).

Table 6 - Expected Increase in Density by Built Form District
Existing R1/R1A Parcels

Built Form District	Acres	Existing net density du/acre	Approx. current du	2040 expected density	Potential du	Potential new du	Percent increase in density
R1/R1A to Interior 1	5,074	7.10	36,036	10.17	51,602	15,566	43%
R1/R1/A to Interior 2	2,801	7.25	20,305	18.08	50,642	30,377	149%
R1/R1A to Interior 3	238	7.28	1,733	22.60	5,379	3,646	210%
R1/R1A to Corridor 4	605	7.49	4,530	31.91	19,305	14,775	326%
R1/R1A to Corridor 6	59	6.74	398	36.09	2,129	1,731	435%

The built form districts included in Table 6 represent the majority of districts that R1 and R1A will be converted to. A description of the built form districts are as follows:

Interior 1: up to three dwelling units per lot, farthest from downtown, not adjacent to transit routes, lots not combined. The expected density is 10.17 however, the permitted density is approximately 21du/acre. Therefore, the expected density is significantly lower than the permitted density.

Interior 2: up to three dwelling units per lot, multi-family buildings with more than three units are permitted on larger lots, larger not defined. Areas between transit routes and intermittent local transit service, limited combing of lots permitted. The permitted density is at least 21 du/acre, greater in areas with larger lots. The expected density is 18.08 du/acre.

Interior 3: no maximum density assigned, building heights 1-3 stories, variety of building types on both small and moderate sized lots, combing lots allowed. The expected density is 22.60 du/acre. A higher density would not be inconsistent with the 2040 Plan.

[8] The 2040 Plan does not include expected densities for the recently added Corridor 3 Built Form District.

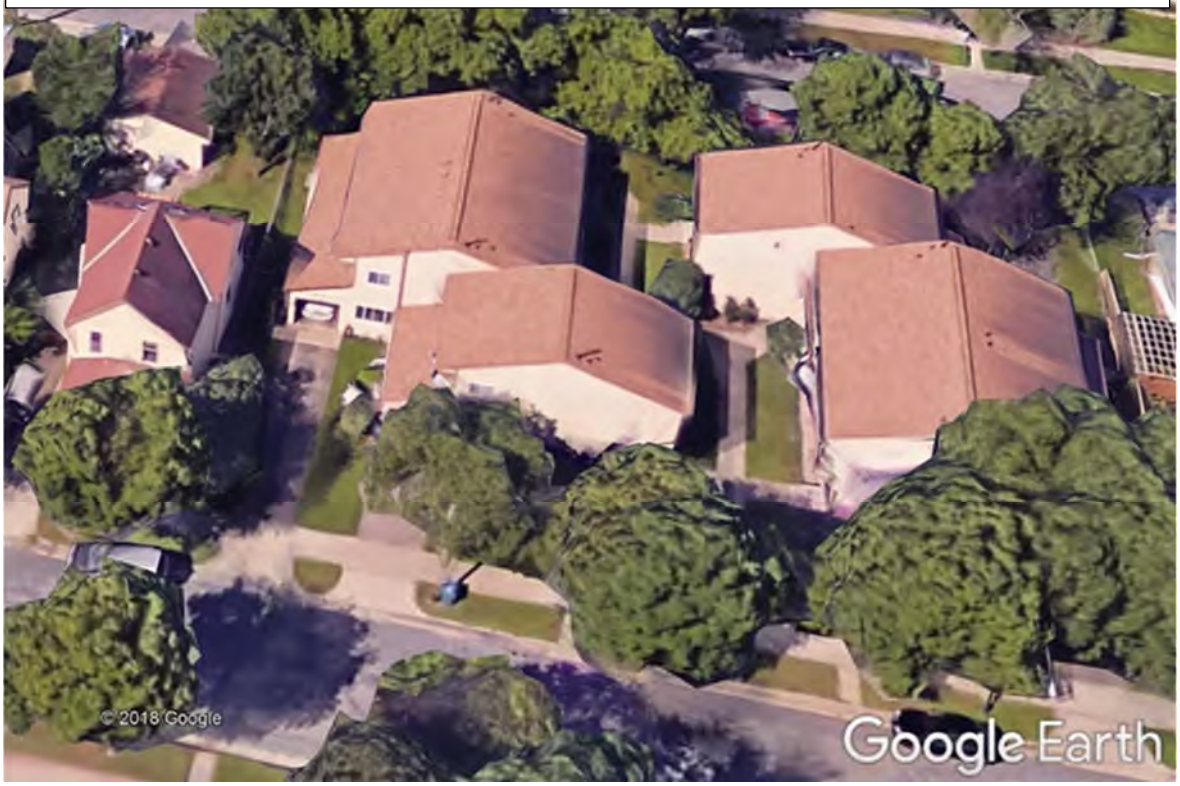
Corridor 4: no maximum density assigned, building heights 1-4 stories (requests to exceed 4 stories evaluated on a case by case basis), variety of building types on both small and moderate sized lots, combing lots allowed. The expected density is 31.91 du/acre.

Corridor 6: no maximum density assigned, building heights 2-10 stories, (requests to exceed 4 stories evaluated on a case by case basis) variety of building types on moderate to large lots. Expected density is 36.09 du/acre.

Figure 5 illustrates visually the difference even a small magnitude of increased density change causes. The lot on the left represents a typical low density single family parcel with a density of approximately 7 du/acre. The two buildings on the right represent a combing of three lots with six dwelling units, resulting in a doubling of density to approximately 14 du/acre. An increase in density of all R1/R1A lots from 7 du/acre to 21 du/acre is permitted in the 2040 Plan, resulting in a greater density change than illustrated on the figure below.

Impacts related to an increase in density can include noise, increased pedestrian and vehicle traffic, parking constraints, and increased stormwater runoff. Increased density can also result from increases to allowed building height or floor area.

Figure 5 Visualizing Increased Density



3.3.2 Intensification of use:

Land use impacts may occur when zoning changes allow different activities and functions to take place on a given parcel or site. Changing the uses allowed in an area can have a negative land use impact when new activities conflict with established functions.

Intensification of use will occur in areas where existing low density residential zoning is reguided to allow commercial land use activities.

Low density residential uses converted to corridor mixed use, or goods and services, which encourage the expansion of commercial zoning and mixed multi use multi-story development, will be subject to an intensification of use.

For example, over 800 parcels (112 acres) of low density land use (existing R1/R1A) will be converted to Corridor Mixed Use in the 2040 Plan.

Environmental Impacts associated with intensification of use may include:

1. Increased noise impacts;
2. Increased pedestrian traffic;
3. Increased vehicle traffic and congestion;
4. Increased congestion and idling;
5. Decreased air quality;
6. Increased parking constraints;
7. Longer hours of activity;
8. Increased light and glare from buildings; and
9. Increased stormwater runoff.

3.3.3 Intensification of scale:

The 2040 Plan states:

"The Built Form Map guides the scale of development for every parcel in the city through Built Form Districts. The built form of all new and remodeled buildings must be consistent with the guidance of the Built Form Map."[9]

Land use impacts may occur from increasing the scale of buildings that can be built in an area.

Land use changes that increase maximum height or floor area ratio (FAR) limits or modify required setbacks can result in scale changes that create land use impacts.

[9]Draft 2040 Plan not dated released online fall 2018. Maps: Future Land Use and Built Form. Page 55.

The 2040 Plan lacks specific standards (e.g. setbacks, impervious area, floor area ratios) other than number of permissible building stories for the individual built form categories.

The most significant adverse impacts occur with the greatest incremental changes.

Intensification of scale occurs with a significant change in building heights. For example, an increase in the permitted height of residential buildings from 2.5 stories to 3, 4 or 6 stories occurs on existing low density residential parcels now included in the Corridor 3, Corridor 4 or Corridor 6 Built Form Districts. Over 8,000 low density residential parcels (over 1,000 acres) will be within the Corridor 3, Corridor 4, or Corridor 6 Built Form Districts. Building scale will also intensify within the transit zone built form districts.

Intensification of scale also occurs with a significant change in building footprint. This type of intensification of scale will occur across much of the City, but the most significant impacts are to the approximately 15,000 existing low density residential parcels (2,000 acres) that will be included in the Interior 3, Corridor 3, Corridor 4, or Corridor 6 Built Form Districts, where combing lots is allowed and/or encouraged, therefore supporting larger building footprints within the combined lots.

3.3.4 2040 Appendixes

2040 Plan includes Appendix B – Land Use. This appendix includes information that is necessary to satisfy the Metropolitan Council requirements related to land use.

Appendix B contains forecasted population, household and employment data, existing land use map and table, future land use table in 10-year stages, expected growth density for future land use categories and built form categories, maps of changes in commercial and production land use areas. There is only very limited text in the Appendix associated with the tables and the text indicates that it is not inconsistent with the policies of the plan to build residential densities a greater than those identified in the tables.

Analysis in Appendix B is limited to demonstrating that the 2040 Plan meets existing and projected land use needs. The November 26, 2018 Plan Amendments proposed by the Council[10] indicate that some areas of the city may grow dramatically. Appendix B does not provide any discussion or identification of land use impacts associated with dramatic growth. Without first identifying impacts, meaningful mitigation cannot and has not been developed.

The 2040 Plan indicates that the City of Minneapolis will update its Zoning Code and Zoning Map to reflect the guidance of the Future Land Use and Built Form Maps after adoption of

[10] CPC Amendments Packet #3 amendments proposed by councilmembers for consideration at the November 26, 2018 Committee of the Whole meeting. Policy 23 Narrative. Retrieved online at https://lims.minneapolismn.gov/Download/File/1871/Minneapolis%202040%20Committee%20of%20the%20Whole%20Amendments%20(Nov%2026%202018).pdf

the plan. Height, bulk and setback standards will work in concert with and be informed by the maps and policies of the plan. This essentially confirms that future regulations will be developed to support the impacts described above, not to mitigate them.

4.0 Stormwater and Water Resource Impacts

Water resources are another area of likely environmental impact as a result of the development and redevelopment induced by the 2040 Plan.

Stormwater discharges are generated by stormwater and snowmelt runoff from land and impervious areas such as paved streets, parking lots, and building rooftops. As stormwater flows across the land and impervious surfaces, the runoff often picks up and transports pollutants in quantities that can adversely affect water quality. Increasing the amount of impervious surfaces increases rate of runoff and volume of runoff. Uncontrolled, these increases result in impacts to water quality, increased flooding, and other impacts.

4.1 Summary of Water Resources Issues

1. The 2040 Plan includes a Water Resources Management Plan (WRMP) Dated October 2018 within Appendix F Wastewater.

2. The goal of the WRMP as stated in the plan is to provide a comprehensive description of the City's water resource management programs and projects at the time the report was published[11].

3. The WRMP does not include an analysis of environmental impacts to water resources that are likely to result from adoption of the 2040 Plan and does not provide specific mitigation to address likely environmental impacts.

4. The WRMP does not identify or address the increase in hard surface, the increase in rates of runoff, the increase in pollutant loads, the increase in flooding potential, or reduction in capacity issues that are likely to occur as a result of the 2040 Plan.

5. The WRMP acknowledges that many of these issues are not addressed in the 2040 Plan, deferring analysis to some future date or plan and states as follows:

"The City is developing models of the stormwater drain system city-wide that when complete, will be used to assess capacity, discharge rates, and runoff volumes generated in each of the 406 unique stormwater pipeshed areas. These models will be used to identify capacity problems, prioritize flood improvements, and evaluate water quality improvement opportunities."

[11] WRMP ES-9

"Once these models are complete, the City will identify the remaining areas of known flooding to determine the need for additional stormwater conveyance capacity or storage capacity." [12]

6. The City considers the Minnesota Stormwater Manual, prepared by the MPCA, to be the City's approved design manual for structural stormwater management practices.

7. The MPCA Stormwater Manual describes the changes in the landscape that occur during urbanization as having a profound effect on the movement of water off of the land.

8. Many of the environmental impacts associated with urbanization originate in the changes in landscape and an increase in impervious area or hard surfaces.

9. Increasing density often results in an increase in hard surface.

10. The 2040 Plan results in an allowed increase in density, which in turn results in the increased hard surface on the majority of existing low density parcels which undergo development or redevelopment consistent with the 2040 Plan.

11. The 2040 Plan does not establish new design standards such as setbacks, percent hard surface, or floor area ratios that will be necessary to achieve the required development or redevelopment built form districts.

12. Increasing hard surfaces without proper mitigation will likely result in:
    - Increased volume of runoff flowing into local surface waters
    - Increased rate of runoff into local surface waters
    - Increased velocity of runoff into local surface waters
    - Shorter time of concentration
    - Increased pollutant loads to local surface waters
    - Reduced groundwater recharge
    - Increased frequency, severity, and duration of local flooding events
    - Diminished capacity of stormwater drainage systems

13. Impacts to receiving waters without proper mitigation will likely result in:
    - Stream widening and bank erosion
    - Stream down cutting
    - Changes to channel bed due to sedimentation
    - Increases in floodplain elevations
    - Degradation of aquatic structure
    - Reduction in habitat diversity and aquatic biodiversity.

[12] WRMP page 4-27

- Reduced base flows
- Increased stream temperatures

14. City stormwater management regulations do not require volume control, rate control, or permanent water quality treatment for site disturbances of one acre or less.

15. The four watershed districts within the City do not establish volume control, rate control, or water quality parameters for redevelopment of lots under 1 acre in size, with the exception of Shingle Creek which requires volume control on sites adding more than 0.5 acres of impervious area.

16. The majority of current low density parcels are under 0.2 acres. Combining six or seven existing low density residential lots may still yield a lot size of less than one acre.

4.2 Analysis of likely impacts

4.2.1 Increased Hard Surfaces

Consistent with the 2040 Plan, built form districts are intended to guide the scale of development for every parcel in the city, independent of the uses allowed on the site. The 2040 plan states that

"The built form of all new and remodeled buildings must be consistent with the guidance of the Built Form Map."

Parcels currently zoned low density residential, were reviewed to determine what built form district would guide their future development or redevelopment. The number of lots and area within each built form district was calculated. The increase in hard surface area was determined for each built form district. Table 7 indicates the percent hard surface assumed for each Built Form District used in modelling likely impacts.

Table 7 - Average Percent Impervious Assumed in Analysis							
District	R1/R1A	Interior 1	Interior 2	Interior 3	Corridor 3	Corridor 4	Corridor 6
Average % Impervious	50	60	65	70	85	85	85
% Increase in Hard Surface Area %		10	15	20	35	35	35

An assumption of impervious area for each built form district was necessary because the 2040 Plan does not include specific building criteria (e.g. setbacks, impervious area) other than number of stories associated with each built form district and the visual renderings presented with each description of the various built form districts.

To help visualize how each built form district will result in an increase in hard surface from the existing conditions, a series of viewsheds from existing R1 and R1A Districts that are within the future Interior 1, Interior 2, Interior 3, Corridor 4, and Corridor 6 Built Form Districts are compared to each of the corresponding built form districts. Built form districts are represented using the conceptual rendering of the built form district provided in the 2040 Plan (Figures 6-10). The area of hard surface on existing R1 and R1A lots was modelled as an average of 50% based on model development guidance included in the 2006 Minneapolis Local Surface Water Management Plan.[13]

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[13] City of Minneapolis, Local Surface Water Management Plan, Appendix M, October 1, 2006

Figure 6
Interior 1 Impervious Surface Comparison

Existing: Looking north from intersection of 12th Avenue South and East 58th Street. Current Zoning R1. Proposed Built Form Interior 1.

Proposed: Interior 1 Built Form (from 2040 Plan)

Figure 7
Interior 2 Impervious Surface Comparison

Existing: Looking north from Intersection of 33rd Street East and 38th Avenue South. Current Zoning R1A. Proposed Built Form Interior 2.

Proposed: Interior 2 Built Form (from 2040 Plan)

Figure 8
Interior 3 Impervious Surface Comparison

Existing: Looking north from intersection of 31st Street E and 38th Avenue South. Current Zoning R1A. Proposed Built Form Interior 3

Proposed: Interior 3 Built Form (from 2040 Plan)

Figure 9
Corridor 4 Impervious Surface Comparison

Looking North from the intersection of W 53rd St and Xerxes Ave S. Current Zoning R1A. Proposed Built Form Corridor 4

Proposed: Corridor 4 Built Form (from 2040 Plan)

Figure 10
Corridor 6 Impervious Surface Comparison

Existing: Looking east along E 46th Street from 42nd Ave S. towards S 43rd Ave. S. Current Zoning R1A. Proposed Built Form Corridor 6.

Proposed: Corridor 6 Built Form (from 2040 Plan)

Analysis of the cumulative impact of increased hard surface area is important in understanding likely environmental effects to downstream stormsewer systems and surface waters because current stormwater regulations, including the Stormwater Ordinance, the Stormwater and Sanitary Sewer Guide,[14] and the applicable watershed district regulations within the city do not regulate peak flow rates or impose water quality treatment criteria for sites under one acre in size.[15] Current stormwater regulations including the Stormwater Ordinance, the Stormwater and Sanitary Sewer Guide[16] and the applicable watershed district regulations within the city also do not regulate volume control for sites under one acre in size, except, the Shingle Creek Watershed Management Commission regulates volume control for non-detached single family home projects on sites greater than 0.5 acres.

The size of existing low density lots typically range from 0.13-0.15 acres, well below the threshold for regulatory control. This means redevelopment activity on the existing low density residential parcels (over 11,700 acres) will be under the regulatory threshold. This is true even when combining seven or eight individual parcels to form a moderate sized parcel consistent with the Corridor 3, Corridor 4, and Corridor 6 Built Form District guidance. The resulting unregulated increases in contaminant load, flow rates, and volumes are likely to cause adverse environmental impacts to the existing storm sewer system and to downstream water resources.

4.2.2 Increased Contaminant Load

Increased hard surface results in an increase in the amount of stormwater contaminants that are carried off of a site and into the storm sewer system. A model was conducted of the predicted contaminant load resulting from the increase in impervious area associated with redevelopment consistent with the City's built form districts.

A P8 model was run to estimate the increase in contaminant load on an annual basis. P8 is a model used for predicting the generation and transport of stormwater runoff pollutants in urban watersheds. Continuous water-balance and mass-balance calculations are performed using rainfall data. The model is used by engineers and planners in designing and evaluating runoff treatment schemes for existing or proposed urban developments. In this case, the model was used to estimate the increase in annual average contaminant load to assess the cumulative water quality impacts. Table 8 includes the results of the P8 analysis.

[14] City of Minneapolis Stormwater and Sanitary Sewer Guide. Sewer and Developed by Minneapolis Public Works Surface Water Sewers Division October 2017

[15] They do require soil erosion control plans that protect stormwater runoff during construction activity when site soils are disturbed.

[16] City of Minneapolis Stormwater and Sanitary Sewer Guide. Sewer and Developed by Minneapolis Public Works Surface Water Sewers Division October 2017

Table 8 - Annual Increased Contaminant Load to Storm Sewer System from redevelopment of R1/R1A parcels consistent with 2040 Plan			
Contaminant	Existing (pounds per year)	2040 Plan Buildout (pounds per year)	Increase (pounds per year)
Total Suspended Solids (TSS)	279,294	498,661	219,367
Total Phosphorous (TP)	1,107	1,835	728
Total Nitrogen (TKN)	5,315	8,628	3,313
Copper	158	263	105
Lead	60	104	44
Zinc	567	920	353
Hydrocarbons	7,451	12,945	5,494

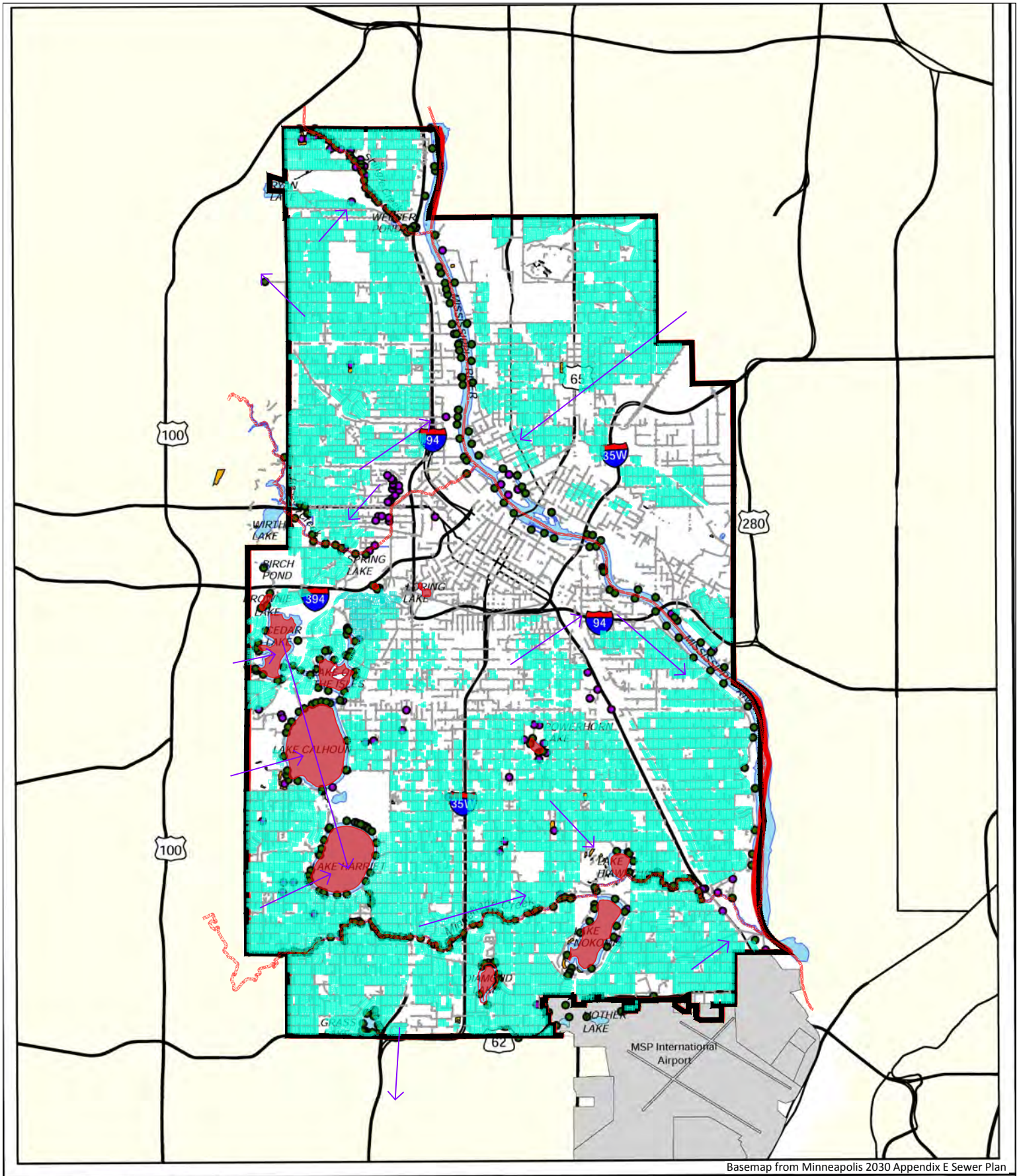
This analysis was limited to the existing R1/R1A single family parcels (conservatively estimated at 8,300 acres) that will be guided to one of the six built form districts discussed above. Increases in contaminant load will also be generated from hard surface increases in the low density R2/R2B parcels (approximately 2,800 acres) as well but, but these areas were not modelled. Therefore, the results indicated on Table 8 are only a portion of the total increase in contaminant load that can be expected under full build out conditions of the 2040 Plan. Even without full build out, those areas of the city that experience the greatest growth will contribute the most to the contaminant load to nearby receiving waters.

According to information contained in Appendix F of the 2040 Plan, the existing storm sewer system has 419 outfalls that discharge into 22 lakes, four streams and the Mississippi River. Some of these waterbodies are listed by the Minnesota Pollution Control Agency as impaired waters, meaning they already have compromised water quality. The additional contaminant load resulting from the increased density and hard surface area of lots less than one acre in size will add to stress from pollutants such as nutrients, bacteria, and suspended solids on receiving waterbodies within these watersheds.

Figure 11, Increased Contaminant Load to Impaired Waters, illustrates a map of the existing storm sewer outfall locations, impaired waters and the current extent of low density residential lots that are in the future Interior 1, Interior 2, Interior 3, Corridor 3, Corridor 4, and Corridor 6 Built Form Districts. This figure illustrates the widespread nature of the impact, the connection between increased contaminant loads and the city's stormsewer system, and the receiving surface water resources that will receive the increased contaminant load.

4.2.3 Increased Volume of Runoff

Increased hard surface (impervious area) also results in less stormwater being able to soak into the ground and more stormwater running off of a site into the streets and storm sewer system. Increased hard surface results in an increase in the volume of stormwater leaving a site and entering the storm sewer system as well as the rate at which it flows from the site.



Low Density Residential Lot with I1, I2,I3, C4, or C6 2040 Built Form Designation

MPCA 2018 Proposed Impaired Water

Pipeshed Flow path

Figure 11
Increased Contaminant Load to Impaired Waters

City Storm Sewer
Highways
Grit Chambers
Outfalls
Stormwater Basins

Exhibit 1

A HydroCAD model was developed to estimate the increase in volume and rate of runoff resulting from development consistent with full buildout of the 2040 Plan. The model was run for one acre sites within each built form category to estimate the increase in rate and volume of runoff on a per acre basis. The results were compared to existing condition to determine the percent of increase. The results can be multiplied by the number of acres within each built form category to estimate the cumulative impact across the over 8,000 acres of R1/R1A parcels that will be guided by one of these 6 built form districts. The model results for the increase in rate of runoff are illustrated on Table 9.

Table 9 - Increase in Rate of Stormwater Runoff from R1/R1A Parcels to Future Built Form Districts

Event	Interior 1	Interior 2	Interior 3	Corridor 3	Corridor 4	Corridor 6
	Increase	Increase	Increase	Increase	Increase	Increase
2-YR	16%	24%	31%	109%	109%	109%
10-YR	9%	13%	18%	75%	75%	75%
100-YR	3%	4%	5%	44%	44%	44%

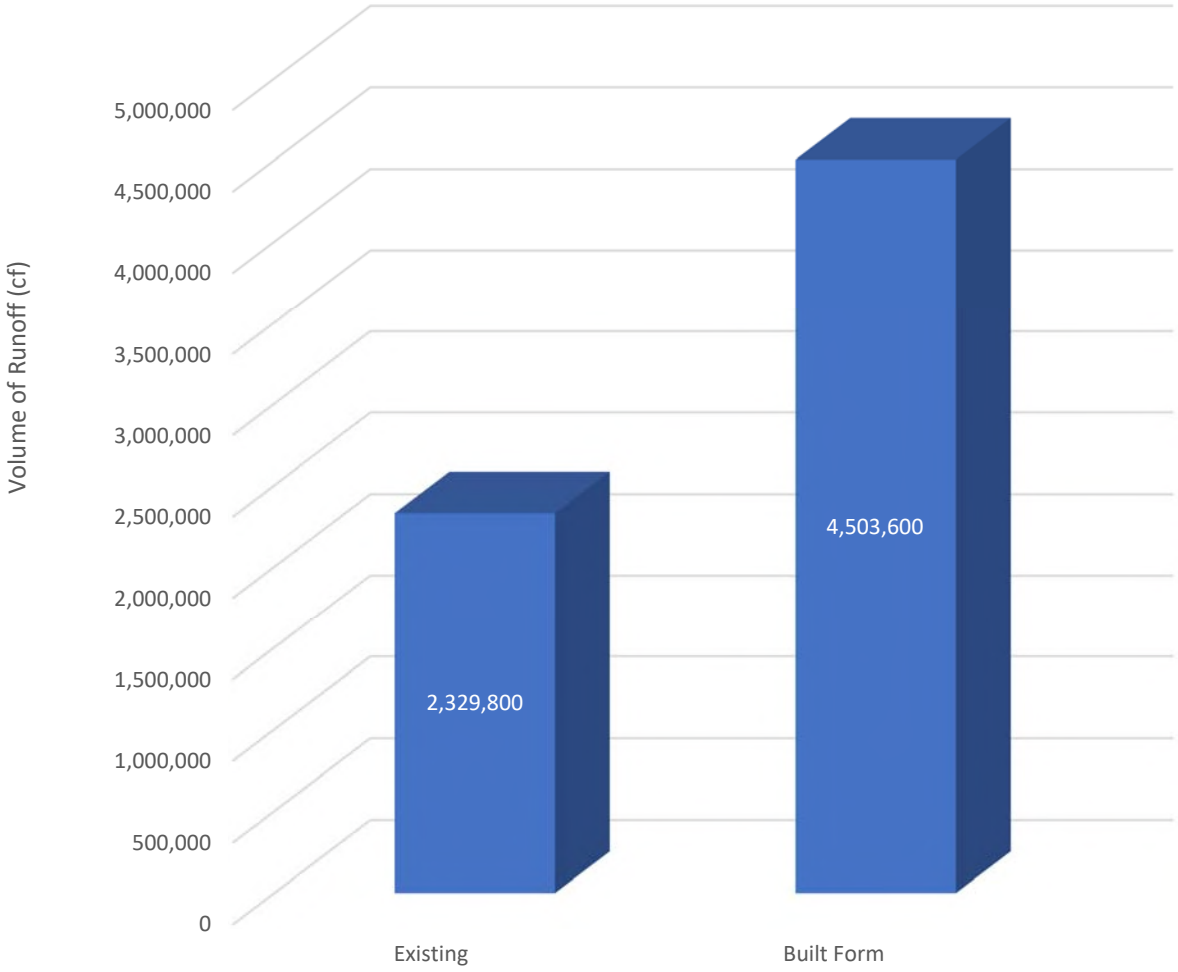
Table 10 - Volume of Stormwater Runoff Existing R1/R1A v. Future Built Form Districts (cubic feet per acre)

Event	Existing	Interior 1	Interior 2	Interior 3	Corridor 3	Corridor 4	Corridor 6
2-YR	3,883	4,375	4,620	4,867	7,506	7,506	7,506
10-YR	6,893	7,471	7,759	8,050	11,853	11,853	11,853
100-YR	15,156	15,710	15,983	16,263	22,467	22,467	22,467

The results show that the increase in rate of runoff and volume of runoff is greatest for low intensity, higher frequency events. This is because for larger rainstorm events, the soils in permeable areas become saturated and do not infiltrate water as readily.

The results also show that built form districts with higher densities will experience the greatest increases in the volume of runoff. For example, Figure 12 depicts the modelled increase in the volume runoff as a result of increased hard surface for 600 acres of existing single family lots redeveloping in the future to Corridor 3, 4, and 6 Built Form districts.

Figure 12 Volume of Runoff
2 YR-24 HR Rainstorm Event
Existing Single family to Corridor 3, 4, and 6 Built Forms



The increased volume of runoff will occur throughout the existing low density residential district. Runoff will flow to the existing stormwater sewer system. Increased rate and volume of runoff entering the system can result in increased flooding and stormsewer capacity issues. Appendix F of the 2040 Plan indicates that the primary function of the stormwater

Exhibit 1

drain system is to convey the peak flows generated by storm events and to prevent damage to infrastructure, private properties, natural systems, and receiving waters. Appendix F indicates that the city has not assessed the capacity, discharge rates, or runoff volumes generated in each of the areas served by the city's storm sewer system.

Appendix F of the 2040 Plan indicates that the design criteria of some older portions of the existing storm sewer system was the 2 or 5 yr storm event with 1 to 24 hours in duration. Current design criteria is the 10 yr-24 hour storm event. Segments of the system that were designed under previous standards will be more susceptible to flooding. Table 10, taken from information in the 2030 Comprehensive Plan, illustrates that a significant portion of the city's stormsewer system was built before the 1960's.

Table 10 Excerpt from 2030 Plan

Table 4-3. Storm Drainage

Year Built	% of Storm Sewer System by Length
Pre-1900	0.1%
1901 – 1910	0.3%
1911 – 1920	0.5%
1921 – 1930	2.7%
1931 – 1940	27.0%
1941 – 1950	7.5%
1951 – 1960	8.8%
1961 - 1970	16.8%
1971 – 1980	17.1%
1981 – 1990	14.3%
1991 – 2000	4.7%
2001 - 2006	0.1%

The 2040 Plan has not evaluated capacity, discharge rates, and runoff volumes associated with the land use changes contemplated in the plan or the impacts of the increase in volume of runoff and contaminant loads on downstream water resources, some of which are currently impaired. The current stormwater management regulations, which apply to sites greater than one acre in size, do not regulate these increases.

Increased volume of runoff associated with the future built form districts will negatively impact the severity of existing flooding problems and may induce flooding in segments of the system that are currently near capacity.

The 2040 Plan does not identify areas of the city that currently experience flooding or that would be prone to flooding with increases in stormwater rates of runoff or volume of runoff.

The plan indicates that currently "segments of the system have insufficient capacity and experience pressurization and /or surface floods during relatively small rainfall events."

The 2030 Plan included a map that identifies areas of the city with flooding issues at the time the 2030 Plan was prepared (Figure 13). Some of these areas may have been rectified with public improvement projects, but the 2040 Plan indicates that some flood prone areas still exist.

Many water resources within the city are currently listed as impaired waters. Because of increased development, the waterbodies within the watersheds of these resources will continue to experience stress from pollutants such as nutrients, bacteria, and suspended solids.

Likely impacts include:

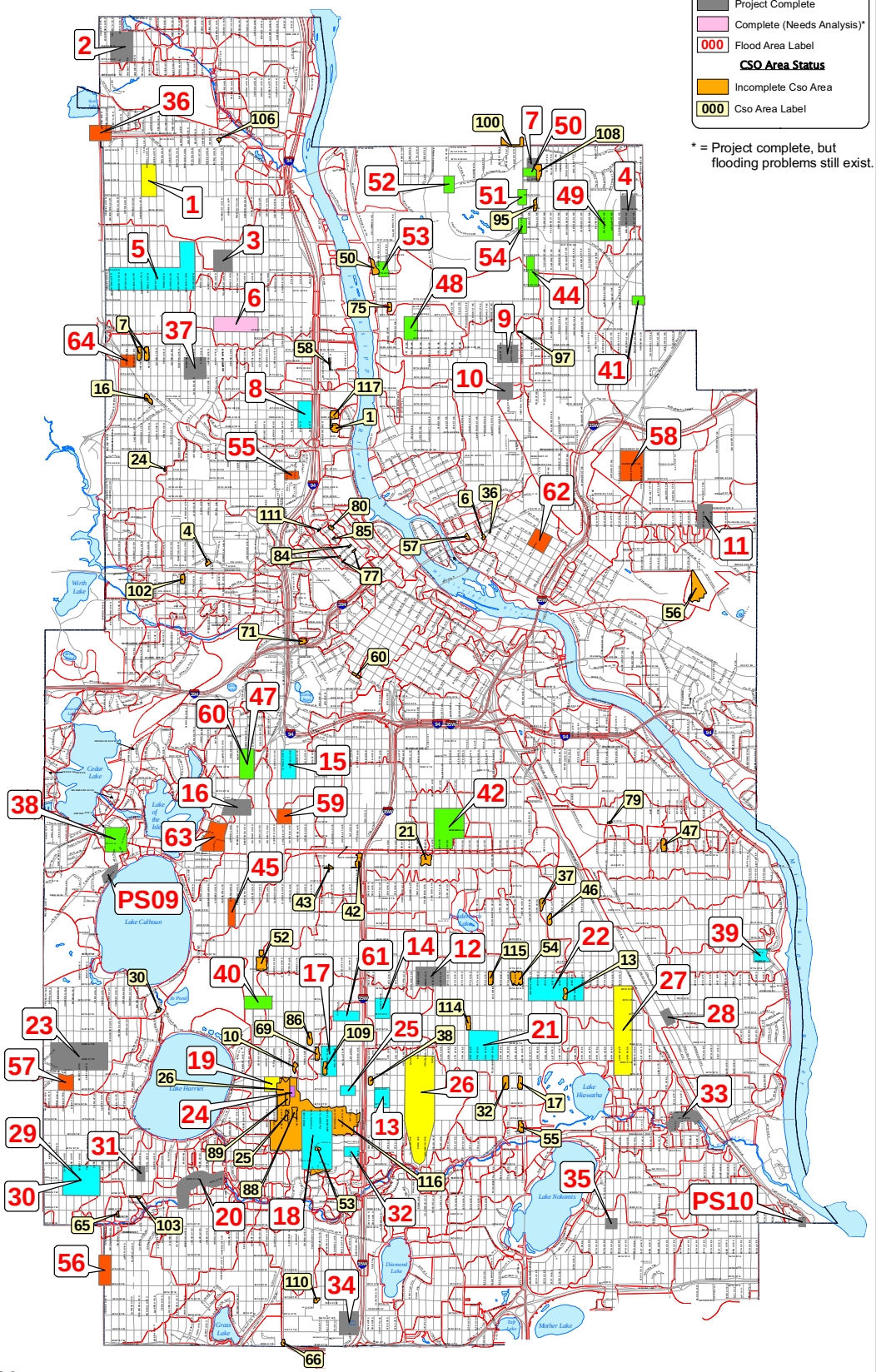
1. Increased volume of runoff flowing into local surface waters
2. Increased rate of runoff into local surface waters
3. Increased velocity of runoff into local surface waters
4. Increased pollutant loads to local surface waters
5. Reduced groundwater recharge
6. Increased frequency, severity, and duration of local flooding events
7. Diminished capacity of stormwater drainage systems

4.2.4 2040 Plan Appendixes

The 2040 Plan includes Appendix A – Mississippi River Corridor Critical Area Plan, Appendix E Resources and Resilience, and Appendix F Wastewater.

The Mississippi River Corridor Critical Area (MRCCA) is a specially designated area adjacent to the Mississippi River protected by state regulation that extends beyond the city of Minneapolis to the north and to the south. The MRCCA contains many significant natural and cultural resources, including: scenic views, water, navigational capabilities, geology and soils, vegetation, minerals, flora and fauna, cultural and historic resources and land and water based recreational resources. The MRCCA is governed by special land planning requirements and land development regulations. These regulations, which are implemented through local MRCCA plans and ordinances, have been developed to protect and preserve the natural, scenic, recreational, and transportation resources along the designated section of the Mississippi River.

The MRCCA Plan included as Appendix A generally adopts the minimum development standards and criteria provided for in Minn. Rules Chapter 6106, which were established by the Minnesota Department of Natural Resources (MDNR). The MRCCA plan contains specific development requirements relating to height restrictions, structure tiering, structure setbacks as well standards for conditional use permits to increase height limits.



FA#	LOCATION	OUTFALL	STATUS
PS09	Excelsior Blvd & Lake Calhoun	54-170	Project Complete
PS10	Lyndale Ave S Storm Drain	10-720A	Project Complete
1	42nd Ave N & Russell Av N	20-210B	Under Construction
2	51st Ave N & Vincent Ave N	20-010	Project Complete
3	37th Ave N & Humboldt Ave N	10-150	Project Complete
4	33rd Ave NE and Benjamin St NE	10-100	Project Complete
5	Crystal Lake	83-010	Engineers Report Complete
6	53rd Ave N Storm Drain	10-120	Complete(Needs Analysis)
7	35th Ave NE and Polk St NE	10-100	Project Complete
8	3rd St N at 23rd Ave N	10-230	Engineers Report Complete
9	Holland Neighborhood Flood Basin	10-180	Project Complete
10	18th Ave NE & Quincy St NE	10-320	Project Complete
11	Talmage St & Hoover St NE	10-460G	Project Complete
12	37th & 38th St E & Columbus Av S	76-010	Project Complete
13	Clinton Ave S - 45th to 46 St E	70-330	Engineers Report Complete
14	Clinton Av S & 36th St E	10-430R	Engineers Report Complete
15	22nd St W & Garfield Av S	10-430J	Engineers Report Complete
16	Jefferson Elementary School	83-150	Project Complete
17	43rd St W & Wentworth Ave S	10-430J	Engineers Report Complete
18	50th St W & Washburn Ave S	10-430D	Engineers Report Complete
19	Aldrich Ave S & 44th St W	57-020	Under Construction
20	Minnehaha Creek - Humboldt to Newton Ave S	70-110,120,130, 145	Project Complete
21	Hiawatha Golf Course Flood Prone	76-010	Engineers Report Complete
22	Sibley Field	76-010	Engineers Report Complete
23	43rd St W & Abbott Ave S	54-080A/B/C	Project Complete
24	45th St W & Lyndale Ave S	10-430J	Design Complete
25	45th St W - Nicollet to 1st Ave S	10-430J	Engineers Report Complete
26	43rd St E & Park Av S	70-350	Under Construction
27	44th St E to 29th Ave S	70-470	Under Construction
28	40th St E and Snelling Ave S	57-100A/B	Project Complete
29	50th to 51st St W & York to Zenith Ave S	57-130	Engineers Report Complete
30	51st St W & Abbott Ave S	57-100	Engineers Report Complete
31	Sheridan Ave S - 50th to 51st St W	57-070	Project Complete
32	46th St E & Stevens Ave S	70-330	Engineers Report Complete
33	Minnehaha Creek - 34th to 38th Ave S	70-535,545,555	Project Complete
34	60th St W - Nicollet to Stevens Ave S	57-070	Project Complete
35	54th St E & 28th Ave S	10-720F	Project Complete
36	Victory Mem Pkwy & Xerxes Ave N	83-010	Problem Identified
37	29th & Logan Ave N	40-010	Project Complete
38	Dean Parkway	54-150	Engineers Report Complete
39	46th Ave S - 36th to 37th St E	10-670	Engineers Report Complete
40	59th St W & Kings Highway	10-430J	Preliminary H & H Analysis
41	27th Ave NE & Stinson Blvd NE	10-440E	Preliminary H & H Analysis
42	Abbott Hospital - E 38th St & 15th Ave S	10-430Y	Preliminary H & H Analysis
43	29th Ave NE & Tyler St NE	0-100	Preliminary H & H Analysis
44	33rd St W & Girard Ave S	54-040	Problem Identified
45	22nd St W & Emerson Ave S	53-130	Preliminary H & H Analysis
46	Lowry Ave NE & 2nd St NE	10-150	Preliminary H & H Analysis
47	22nd Ave NE & Garfield Ave NE	0-100	Preliminary H & H Analysis
48	Polk St NE & Tyler St NE (Alley)	0-100	Preliminary H & H Analysis
49	54th Ave NE & Central Ave NE	0-100	Preliminary H & H Analysis
50	5th St NE & 35th St NE	10-100	Preliminary H & H Analysis
51	Randolph St NE & 29th Ave NE	10-100	Preliminary H & H Analysis
52	St. Anthony Pkwy. W of Central Ave	0-100	Preliminary H & H Analysis
53	Lyn Park Av & Lyn Park Lane N	10-450C	Problem Identified
54	Xerxes Av S & 57th St W	70-655	Problem Identified
55	Chowen Av S & 45th St W	54-080	Problem Identified
56	Summer St NE & Mckinley Pl S	10-450L	Problem Identified
57	Lyndale Ave S - 28th to 27th St W	10-430J	Problem Identified
58	4129 Emerson Ave S	53-120	Problem Identified
61	40th St E - Van Nest Ave to I-35W	10-430U	Engineers Report Complete
62	8th Ave SE & 7th St SE	10-450A	Problem Identified
63	28th St W & Humboldt Ave S	53-160	Problem Identified
64	Lyon Ave N & 29th Ave N	40-101	Problem Identified

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CSO_ID	LOCATION	OUTFALL
1	4 CBs E of 2nd St N on 22nd Av N	10-220
4	2 CBs on Elwood Av & James Av N	40-240
6	CB N of 4th St SE, btw Central Av & E Hennepin	10-350
7	CBs in 2 alley near Sheridan Av N & 29th Av N	40-010
10	CB in alley S of 43rd St btw Harriet & Garfield Av S	10-430U
13	CB in alley btw 22nd & Standish Av S; 38th to 39th St E	76-010
16	CB in alley near Sheridan Av N & 24th Av N	40-010
17	CB in alley N of E 46th St, btw Cedar & 18th Av S	76-010
20	2 CBs on Oakland Av, N of Lake St E	10-830U
21	2 alley drains N of Lake St E, E & W of Columbus Av S	10-430U
24	CB at Penn Av N & 17th Av N	40-010
25	CB in alley btw Lyndale & Garfield Av S; 46th to 47th St W	10-430U
26	15 CBs at 46th St W & Lyndale, also E to Garfield Av S	10-430U
30	2 CBs at Ozaan Av S & Wm Berry Pkwy	54-060
32	CB in alley btw 19th & 17th Av so. 44th to E 45th St	76-010
36	CB at E Hennepin Av & Central Av NE	10-450A
37	CB in alley btw 19th & 20 Av S; S of E 32nd St	76-010
38	CB in alley S of 44th St E, btw 2nd & 3rd Av S	70-330
42	3 CBs & SD @ E Lake St & Stevens Av S	10-430M
43	2 CBs at Bassett Av & W Lake St	10-430D
46	CB in alley N of 34th St E, btw 20th & 21st Av	10-680
47	CB in alley N of 29th St E btw 33rd to 34th Av s	10-630C
50	2 CBs at Marshall St NE & 29th Av NE	10-100
52	2 alley CBs & 4 CBs - 36th to 37th St W, Bryant to Dupont Av S	10-430V
53	CB in alley near 46th St W btw Pleasant & Rustic Lodge Av	70-330
54	2 alley CBs; 4 CBs W of 18th to Cedar Av S; 37th to 38th St E	76-010
55	CB in alley N of E Minnehaha Pkwy btw 19th & Cedar Av S	72-130
56	4 CBs & SU on 24th Av SE; S of 6th St SE	10-460D
57	CB on University Av NE btw 1st Av NE & Hennepin Av E	40-350
58	CB at 2nd St N & 26th Av N	10-130
59	4 CBs W of E Lake St, on 15th Av S	10-430J
60	CB on 12th St S @ Nicollet Mall	10-410E
65	CB on Vincent Av S & Brookwood Terrace	70-650
66	2 CBs on Lyndale Av S; N of Crosstown Hwy Bz	71-070
69	CB in alley N of 43rd St W, btw Pleasant & Pleasant Av S	10-430U
71	2 CBs at Lyndale Av & 16th St N, also CB in pkg lot	41-020
75	2 CBs on Grand St NE, 26th to 27th Av NE	10-030
77	CBs on 6th Av N, btw 4th St N & Washington Av N	40-340
79	2 CBs at 27th Av N & E 27th St	10-530A
82	CB on 4th Av N, Washington Av N to 3rd St N	40-360
84	2 CBs at Cliff St & 7th Av N, Washington Av N to 4th St N	40-340
85	2 CBs on 8th Av N, Washington Av N to 3rd St N	40-360
86	CB in alley N of 42nd St W, btw Girard & Pleasant Av S	10-430T
87	Sewer more line near Morgan Av S & Laurel Av W	40-140
88	CB in alley S of 46th St W, btw Garfield to Harriet Av S	10-430D
89	CB in alley N of 32nd Av NE, btw Tyler & Polk St NE	10-100
98	CB on Lowry Av NE, btw Jackson and Central Av NE	10-450J
99	CB in alley N of 32nd Av NE, btw Tyler & Polk St NE	10-100
100	4 CBs at 27th Av NE & Van Buren St NE	10-100
102	CB in alley N of 5th Av N, btw Nelson & Morgan Av N	40-220
103	CB at Upton Av S & W 32nd St	87-010
106	2 CBs at Humboldt Av N & 46th Av N	20-210A
108	Emergency overflow at 36th Av NE & Polk St NE	10-100
109	CB in alley S of 42nd St W, btw Pleasant & Wentworth Av	10-430U
110	CB in alley N of Pleasant Av, btw 35th & 36th St W	71-070
111	CB on S side of 16th Av N, 3rd St NW to N	40-330
114	CB in alley N of 41st St E, btw 13th & 14th Av S	76-010
115	CB in alley N of 38th St E, btw 15th & Bloomington Av S	76-010
116	Temporary connection at E 40th St & Stevens Ave S	70-350
117	CBs on E side of 2nd St N & 23rd Av N	10-220

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FIGURE 13

From Minneapolis 2030 Appendix E

City of Minneapolis

Flood Areas and Future CSO Projects

Local Surface Water Management Plan

Figure 4-6

Exh

The MRCCA plan specifically addresses the built form districts within the MRCCA. Where the built form guidance guides for a height greater than the Critical Area districts, the Critical Area regulations apply. Where the Critical Area districts allow for a conditional use permit to increase height, the built form category provides additional guidance on appropriate building height.

Figure 14 MRCCA

The plan also addresses other environmental topics including native plant communities, cultural and historical properties including land marks, historic places, historic districts, viewsheds, gorges, unstable soils and bedrock, bank and slopes restoration priorities, erosion prevention, bank and slope stabilization, open space and recreational facilities. The MRCCA plan identifies environmentally sensitive resources and establishes specific criteria to minimize impacts to the river that could occur during development. The MRCCA Plan accomplishes the task of identifying likely environmental impacts and addressing them through specific mitigation measures and design standards.

The MCRRA plan is only relevant to the MCRAA and does not include the majority of the City of Minneapolis or the water resources within. Figure 14 illustrates the extent of the MRCCA within Minneapolis.[17]

Appendix E Resources and Resilience indicates that it provides supporting content for resilience, natural resources, and special resource protection. The Appendix is 10 pages long and addresses solar resource development. It does not include any discussion regarding how the 2040 Plan could impact solar resources or existing solar systems (for example due to increased building heights) or possible mitigation.

Appendix F Wastewater includes supporting content for wastewater related policies and satisfies the Metropolitan Council requirements related to wastewater, but it does not include any type of analysis to identify likely impacts related to or resulting from induced development permitted in the 2040 Plan.

[17] https://www.knowtheflow.us/2013/12/rules-for-the-mississippi-river-corridor-critical-area/

With respect to stormwater, the appendix includes discussions and links to City's stormwater management plan regulations, and watershed district regulations. The plan does not evaluate capacity, discharge rates, and runoff volumes associated with the land use changes contemplated in the plan or the impacts of the increase in volume of runoff and contaminant loads on downstream water resources, some of which are currently impaired. The plan does not address downstream impacts to surface water resources that are likely to occur under the current regulations which apply for the most part to only to sites greater than one acre in size, or areas within the MRCCA.

The appendix notes that certain areas of the city are currently subject to stormwater capacity issue. It does not address how the increased stormwater volumes will impact flooding. The plan includes a stormwater catchment inventory and describes the current impervious surface data based on existing land use and receiving waters. The inventory does not include an assessment of the changes to the system that will result from the increased density associated with the new land use categories and built form districts within the pipesheds and receiving water bodies.

The Appendix F in general describes the need to balance multiple important water resource issues and concerns including aging infrastructure, management of flooding, and management of quantity and quality stormwater runoff as current trends in water resources management, but does not analyze the repercussions of the implementation of the 2040 Plan on water resources or the storm sewer infrastructure. It does not identify areas that will require mitigation to address those impacts or specific steps that could be taken to reduce or minimize impacts. Appendix F includes capital improvement projects to complete Environmental Protection Agency Requirements for stormwater quality improvements. These are projects resulting from existing water quality and impaired waters issues and do not consider the additional impacts resulting from the 2040 Plan.

Policy 71 of the 2040 Plan includes "reduce impervious cover" as an action step in protecting and improving soil heath. There is no discussion in the 2040 Plan or Appendixes on how this action step can be implemented or the inherent conflict between this action step and the requirement that each new development and redevelopment must meet the new built form guidance, which results in increased impervious surface as illustrated in Figures 6-10.

5.0 Traffic Impacts

The widespread land use changes inherent in the 2040 Plan represent likely significant traffic impacts. Impacts may include:

- roadway and intersection capacity issues;
- pedestrian, bicycle, and vehicle safety conflicts;
- parking issues; and
- congestion and related air quality impacts.

The 2040 Plan does not include a transportation analysis that evaluates the impacts of implementing the range of land use alternatives identified in the 2040 Plan. It does not identify, analyze, or provide specific mitigation of transportation-related impacts. Appendix D Transportation, of the 2040 Plan largely defers transportation related analysis and strategies to a future update to the Transportation Action Plan.

While a transportation impact analysis is beyond the scope of this report, the question of how much more traffic could be generated because of the 2040 Plan to allow increased density throughout the existing single family residential area can be addressed. The permitted density in these areas would increase from one to two dwelling units per parcel to three to four or more dwelling units per acre depending upon the built form district.

A first step is to estimate the number of vehicle trips that may result over the area under both existing conditions and future conditions resulting from the increased number dwelling units permitted under the 2040 Plan. Vehicle trip generation is commonly estimated using rates published by the Institute of Transportation Engineers (ITE) based on land use classifications. The current 10th edition of ITE's Trip Generation Manual categorizes single family, low-rise multifamily containing one to two floors, and mid-rise multifamily containing three to ten floors. Daily trip generation per dwelling unit range from 9.44 trips per day for single family, 7.32 vehicle trips per day for low-rise multifamily to 5.44 vehicle trips per day for mid-rise multifamily land use.[18]

The ITE trip generation rates do not account for a generally recognized reduction in the number of vehicle trips per day in smart growth areas due to the presence of transit, bike and pedestrian friendly facilities. Currently there is debate regarding the appropriate methods for estimating vehicle trip-generation rates associated with smart-growth projects. A number of contributing factors other than land use play a role. A limited review of research literature indicates a wide variation in trip generation rates. For the purpose this general analysis a reduction of 25% of the ITE rates was utilized.

The adjustment factor was taken for the existing low density land uses because they are served by the same transportation, bike and transit facilities as the future land use designations. Table 11 identifies the potential number of new trips generated from permitted new dwelling units on existing single family residential parcels under full buildout of the 2040 Plan within the Interior 1, Interior 2, and Interior 3 built form districts. The calculation estimates that tripling the density on single family parcels will have the effect of approximately doubling the average daily trips. An increase of over 500,000 daily vehicle trips is estimated from the Interior 1, 2 and 3 districts under full build out conditions.

With increased vehicle trips generated in areas that were designed to accommodate lower densities, and therefore fewer vehicle trips per day, traffic infrastructure may be under

[18] Spack Consulting, Trip Generation Multifamily Housing and Land Use, 10/24/2018. Retrieved digitally at https://www.mobotrex.com/2018/05/01/trip-generation-review-multifamily-housing-land-use/

designed, level of service at certain intersections may suffer, and pedestrian, bicycle and vehicle conflicts may impact safety. Table 11 includes the existing and potential daily traffic generation in the Interior 1 Interior 2 and Interior 3 Districts as result of full buildout of the 2040 Plan.

Table 11 - Potential new daily vehicle trips Interior 1, Interior 2, and Interior 3 Built Form Districts

	Parcels	du/parcel	du	Trip Generation Land Use Category	Rate of Trips/du[c]	Adjusted trips/du[d] (25% reduction)	Total Trips per day
Existing							
R1/R1A	56,400	1	56,400	single family	9.44	7.08	399,312
Total							399,312
2040 Plan							
Interior 1	36,000	3	108,000	multifamily low rise	7.32	5.49	592,920
Interior 2	19,000	3[a]	57,000	multifamily low rise	7.32	5.49	312,930
Interior 3	1,400	3[b]	4,200	multifamily mid rise	5.44	4.08	17,136
Total							922,986

[a] up to 4 on larger lots
[b] higher density allowed
[c] ITE Trip Generation 10th, Ed.
[d] 25% reduction for smart growth

Development and redevelopment with increased residential unit density will generate additional vehicle trips locally. Increased density in certain areas may concentrate trip origins and trip destinations which can increase congestion in specific areas.

Limited parking opportunities can further contribute to congestion in certain areas. One of the specific action steps in the 2040 Plan is to eliminate requirements for off street parking minimums in order to promote the plan's goals that prioritizes walking first, followed by bicycling and transit use, and lastly motor vehicle use.[19] There has not been an intermodal transportation analysis study to determine the likely impacts of this policy.

5.1 2040 Plan Appendices:

Appendix D Transportation includes information required to satisfy the Metropolitan Council requirements related to transportation. The appendix includes household employment and population projections for individual transportation analysis zones, and a description of the existing transportation systems. The plan discusses a future transportation action plan that will update the use and design of public right of way right of way, different transit market areas within the city.

[19] 2040 Plan p. 116 October 2018 Draft

Appendix D does not include any type of traffic impact analysis or evaluation of the transportation related impacts that are likely to occur as a result of the land use changes included in the 2040 Plan. The appendix does not address the ability of the local system which was designed and constructed to serve predominantly low density residential development over thousands of acres to now accommodate future traffic demands likely marked by localized areas of dramatic growth. The appendix does not address the repercussions of the plan on congestion at key intersection in the city, the impacts of removing off street parking requirements, or pedestrian, bicycle vehicle conflicts resulting from the densification of certain areas of the city.

6.0 Conclusion

The 2040 Plan establishes a dramatic shift in land use policy with a general city wide increase in permitted density. Proposed changes in land use consistent with the 2040 Plan inherently result in a physical manipulation and impact of the environment, as well as existing infrastructure that was implemented based on entirely different design criteria.

The 2040 Plan focusses on polity and goals and has largely ignored the identification of environmental impacts that are likely to occur as a result of the plan. Without analysis and the identification of the impacts, the plan lacks the development of any specific criteria or mitigation steps necessary to reduce or minimize impacts resulting in likely pollution and harmful effects to natural resources. A review of some environmental topics was provided to illustrate the magnitude of impacts to the air, water, and other natural resources which are likely to occur, but has not attempted to address all areas of concern or provide the detailed analysis required of thorough environmental review.

Other topics of potential environmental impacts include those areas routinely included as part of environmental review or impact assessment; such as changes in cover type (impacts to greenspace), ecological resources, and air quality. The 2040 Plan lacks an analysis of the plan's impact on the environmental, identification of impacts, and specific design criteria or measures which could mitigate likely impacts.

Attachment 1
New unit calculations

BASED ON ACRES IN EACH TEN YEAR INCREMENT

Average Growth Density

	Typical Density Range	Average Planned Density	Existing	2020			2030			2040			Total	Total Acres
					increase			increase			increase		new du	redeveloped
	du/acre	du/acre	acres	acres	acres	du	acres	acres	du	acres	acres	du		
Urban Neighborhood	8-40	24	13,672	13,822	150	3,600	13,972	150	3,600	14,095	123	2,952	10,152	423
Neighborhood Mixed Use	8-40	24	153	167	14	336	180	13	312	207	27	648	1,296	54
Corridor Mixed Use	8-75	42	762	828	66	2,739	894	66	2,739	959	65	2,698	8,176	197
Community Mixed Use	12-125	69	573	623	50	3,425	672	49	3,357	692	20	1,370	8,152	119
Destination Mixed Use	75-150	23	230	250	20	450	270	20	450	620	350	7,875	8,775	390
Production Mixed Use	15-25	40	526	577	51	2,040	627	50	2,000	678	51	2,040	6,080	152
Total						12,590.00			12,457.50			17,582.50	**42,630**	

Maximum Growth Density

	Typical Density Range	Maximum Planned Density	Existing	2020			2030			2040			Total	Total Acres
					increase			increase			increase		new du	redeveloped
	du/acre	du/acre	acres	acres	acres	du	acres	acres	du	acres	acres	du		
Urban Neighborhood	8-40	40	13,672	13,822	150	6,000	13,972	150	6,000	14,095	123	4,920	16,920	423
Neighborhood Mixed Use	8-40	40	153	167	14	560	180	13	520	207	27	1,080	2,160	54
Corridor Mixed Use	8-75	75	762	828	66	4,950	894	66	4,950	959	65	4,875	14,775	197
Community Mixed Use	12-125	125	573	623	50	6,250	672	49	6,125	692	20	2,500	14,875	119
Destination Mixed Use	75-150	150	230	250	20	3,000	270	20	3,000	620	350	52,500	58,500	390
Production Mixed Use	15-25	25	526	577	51	1,275	627	50	1,250	678	51	1,275	3,800	152
Total						22,035			21,845			67,150	**111,030**	

Expected Growth Density

	Typical Density Range	Expected Growth Density	Existing (2015)	2020			2030			2040			Total	Total Acres
					increase			increase			increase		new du	redeveloped
	du/acre	du/acre	acres	acres	acres	du	acres	acres	du	acres	acres	du		
Urban Neighborhood	8-40	37	13,672	13,822	150	5,579	13,972	150	5,579	14,095	123	4,574	15,731	423
Neighborhood Mixed Use	8-40	29	153	167	14	407	180	13	378	207	27	784	1,568	54
Corridor Mixed Use	8-75	60	762	828	66	3,954	894	66	3,954	959	65	3,894	11,802	197
Community Mixed Use	12-125	123	573	623	50	6,126	672	49	6,003	692	20	2,450	14,579	119
Destination Mixed Use	75-150	136	230	250	20	2,723	270	20	2,723	620	350	47,653	53,099	390
Production Mixed Use	15-25	24	526	577	51	1,210	627	50	1,186	678	51	1,210	3,605	152
Total						12,590			12,458			17,583	**42,630**	

From Table 4-1 Expected Growth Density for Future Land Use Categories New units

New Units	DU/Acre		*Acres*
8,163	37.19	Urban Neighborhood	*219*
93	29.04	Neighborhood Mixed Use	*3*
4,525	59.91	Corridor Mixed Use	*76*
18,934	122.51	Community Mixed Use	*155*
6,755	136.15	Destination Mixed Use	*50*
9,454	1,704.74	Public, Office and Institutional	*6*
984	23.72	Production Mixed Use	*41*
48,908	***Total New Units***		

FUTURE LAND USE

FIGURE 3-1: LAND USE TABLE IN 10-YEAR STAGES.

Planned Land Use Table						
Within Urban Service Area	Typical Density Range (Dwelling Units per Acre)		Acres			
Land Uses Allowing Residential Development	Expected Density Range in Dwelling Units Per Acre		Existing (2015)	2020	2030	2040
Urban Neighborhood	8	40	13,672	13,822	13,972	14,095
Neighborhood Office and Services	15	40	64	55	45	36
Neighborhood Mixed Use	8	40	153	167	180	207
Corridor Mixed Use	8	75	762	828	894	959
Community Mixed Use	12	125	573	623	672	692
Destination Mixed Use	75	150	230	250	270	320
Production Mixed Use	15	25	526	577	627	678
Public, Office, and Institutional	8	175	2,140	1,835	1,530	1,245

Exhibit 1

	Average of typical range in Urban Neighborhood					
Current Zoning District	Acres in UN	Existing permitted density (du/acre)	Current permitted (du)	Future permitted density[2] (du/acre)	Future (du)	Potential New Units
R1/R1A	8,500	8.71	74,035	24	204,000	129,965
R2/R2B	2,800	17.42	48,776	24	67,200	18,424
Total	11,300		122,811		271,200	**148,389**
	Expected growth density URBAN NEIGHBORHOOD					
Current Zoning District	Acres in UN	Existing permitted density (du/acre)	Current permitted (du)	Future permitted density2 (du/acre)	Future (du)	Potential New Units
R1/R1A	8,500	8.71	74,035	37.19	316,115	242,080
R2/R2B	2,800	17.42	48,776	37.19	104,132	55,356
Total	11,300		122,811		420,247	**297,436**

FUTURE LAND USE

FIGURE 3-1: LAND USE TABLE IN 10-YEAR STAGES.

Planned Land Use Table						
Within Urban Service Area	Typical Density Range (Dwelling Units per Acre)		Acres			
Land Uses Allowing Residential Development	Expected Density Range in Dwelling Units Per Acre		Existing (2015)	2020	2030	2040
Urban Neighborhood	8	40	13,672	13,822	13,972	14,095
Neighborhood Office and Services	15	40	64	55	45	36
Neighborhood Mixed Use	8	40	153	167	180	207
Corridor Mixed Use	8	75	762	828	894	959
Community Mixed Use	12	125	573	623	672	692
Destination Mixed Use	75	150	230	250	270	320
Production Mixed Use	15	25	526	577	627	678
Public, Office, and Institutional	8	175	2,140	1,835	1,530	1,245

DENSITY CALCULATIONS

FIGURE 4-1: EXPECTED GROWTH DENSITY FOR FUTURE LAND USE CATEGORIES

Future Land Use Category	New Units	DU/Acre
Neighborhood Mixed Use	93	29.04
Corridor Mixed Use	4,525	59.91
Community Mixed Use	18,934	122.51
Destination Mixed Use	6,755	136.15
Public, Office, and Institutional	9,454	170.74
Production and Processing	-	0.00
Production Mixed Use	984	23.72
Urban Neighborhood	8,163	37.19

Resume

Kirsten A. Pauly, P.E., P.G.

Professional Civil Engineer, Professional Geologist.

Professional Experience:

Sunde Engineering, PLLC **1983–present**

Managing partner of Sunde Engineering, PLLC, since 2005. Sunde Engineering is a full service civil and environmental engineering consulting firm located in Bloomington, Minnesota. Our civil and environmental engineering groups provide a full range of engineering design and construction management services for private and public clients.

Over 30 years of experience providing consulting services focused on land use development including residential, commercial and industrial properties. Work involves site planning, site analysis, natural resource inventories, grading, drainage, stormwater management, hydrologic and hydraulic analysis, utility design, and groundwater investigations.

Preparation of detailed hydrologic investigations including analysis of surface and groundwater flows on regional and local scales, establishment of flood elevations, utilization of computer modeling techniques, and preparation of wetland replacement plans.

Prepared, managed, or worked as a team member for environmental review for a variety of projects including Environmental Assessment Worksheets, Environmental Impact Statements, Alternative Urban Areawide Review, and Phase 1 and Phase 2 investigations.

Environmental permitting including Minnesota Pollution Control Agency NPDES permits, (construction and industrial), solid waste permits (landfill, metal recycling, single sort recycling, yard waste composting) Minnesota Department of Natural Resources water appropriations permits, work in shoreland, Minnesota Department of Natural Resources, access, driveway, drainage permits and well as local land use permits. Watershed District permits, County and local permits involving, conditional use, interim use, land use, grading and drainage, soil and erosion control.

Preparation of stormwater pollution prevention plans, Stormwater pollution prevention training educator for on-site training, certified erosion and stormwater management construction site management, spill prevention control and countermeasures plans.

Education: M.S. Civil Engineering, 1990, University of Minnesota
B.A. Geology, 1983, Colorado College

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Registered Professional Geologist, Minnesota