

2050 Growth Scenario Methodology

Summary

Introduction and Background

A long-range transportation plan (LRTP) must project transportation demand for persons and goods over the period of the plan. To complete this task, the MPO must develop a growth scenario that forecasts housing and employment growth out to the plan’s horizon year and identifies where this growth will likely occur. The growth scenario process is important in that it feeds into the MPO’s travel-demand model. The model is used to estimate traffic flows into the future and helps to inform planning decisions.

Figure 1 shows the total growth for housing units and employment that was used for the growth scenario. The following appendix outlines how staff arrived at these numbers.

Figure 1: Housing Unit and Employment Growth Totals

	Total Housing Unit Growth	Total Employment Growth
Altoona	5,509	5,396
Ankeny	22,878	12,069
Bondurant	4,640	1,508
Carlisle	595	832
Clive	3,260	3,792
Des Moines	13,663	100,022
Grimes	3,959	3,543
Johnston	9,642	6,333
Mitchellville	18	313
Norwalk	3,319	3,371
Pleasant Hill	3,847	2,191
Polk City	1,222	410
Urbandale	12,319	14,087
Waukee	10,470	7,108
West Des Moines	17,469	34,187
Windsor Heights	70	1,341
Dallas County	-	-
Polk County	2,883	8,424
Warren County	-	-
Total	115,763	204,927

Steps to Develop the Growth Scenario

The following steps were undertaken to develop the 2050 Growth Scenario.

1. Established base-year population and employment data for the MPO planning area and individual jurisdictions;
2. Determined employment growth allocations out to 2050 for each subarea;
3. Determined population growth allocations out to 2050 for each jurisdiction;
4. Work with community representatives to assign their allocated growth using the Envision Tomorrow software; and,
5. Aggregate allocated growth to TAZs for use in the travel-demand model.

Detailed Information

The following section provides a more in-depth explanation of the process and methodology used to develop the final 2050 Growth Scenario.

Geography

The 2050 Growth Scenario includes multiple steps that involves the collection, aggregation, and/or forecasting of data at a variety of geographic levels. The following is an explanation of the geographic levels used throughout the growth scenario process.

- Four-county level: The MPO's Metropolitan Planning Area (MPA) resides is parts of Polk, Dallas, Warren, and Madison Counties, which are referred to throughout this document as the four-county level. Woods & Poole data is provided at the county level and, therefore, must be adjusted to provide Planning Area data.
- Metropolitan Planning Area (MPA): The MPA includes areas within Polk, Dallas, Warren, and Madison Counties that are expected to be urbanized by the year 2050.
- Subarea: The MPO's MPA boundary is divided into seven subareas. These subareas were established during The Tomorrow Plan's development based on interviews with real estate and community development/economic development professionals, consideration of symbolic and physical boundaries, analysis of real estate supply data and development trends, and previous subareas used by the MPO.
- Traffic Analysis Zone: The MPA is divided into more than 1,000 TAZ for use in travel-demand modeling.
- Parcel-Based Geography: Base-year employment data and future year growth assignments were completed using parcel-based geography. These geographies were based upon land parcels. To limit the size of parcels, a one-acre layer was placed over the parcel map which resulted in the subdivision of some parcels.

<<Include the following maps>>

MPA, Subareas, TAZs

Step 1: Establish Base-Year Population and Employment Data

MPO staff collected data for housing units and employment that was current as of 2016, which serves as the base year. Housing unit information was collected from each county assessor's parcel database and were aggregated to each jurisdiction. Base employment data was collected from the parcel database using the ratios outlined in Figure 3.

Figure 2: Base Housing and Employment

	Housing Units	Employment
Altoona	7,238	10,779
Ankeny	25,516	24,152
Bondurant	2,088	1,020
Carlisle	1,689	1,425
Clive	7,041	15,406
Des Moines	95,044	197,156
Grimes	5,127	5,565
Johnston	8,347	12,648
Mitchellville	767	632
Norwalk	4,461	2,341
Pleasant Hill	3,984	4,381
Polk City	1,779	832
Urbandale	17,666	28,048
Waukee	8,133	5,409
West Des Moines	29,061	67,946
Windsor Heights	2,330	3,441
Dallas County	1,625	452
Polk County	9,453	15,761
Warren County	1,386	779
Total	232,735	398,173

Figure 3: Employment Ratios by Category

Employment was estimated following a parcel-based methodology. MPO staff collected GIS information for commercial and industrial use parcels within each county. Information collected included the parcel size, detailed occupancy, building area, height, and age of the building. The detailed occupancy information was used to categorize each parcel into one of 10 categories, and a jobs-per-square-foot ratio was applied to each building, as illustrated in Figure 3. Mixed-use buildings were addressed as well by identifying parcels with a mix of uses and estimating the percentage of each building's area attributed to each use. Employment for each parcel was calculated by taking the building area, multiplied by the number of floors, multiplied by the jobs-per-square-foot ratio.

Use Category	Jobs/Square Foot Ratio
Education	969
Hospital	385
Hotel	3,000
Manufacturing	750
Office	250
Public Assembly	1,400
Religious Worship	2,000
Retail	500
Senior Care	1,000
Warehouse/Flex	1,250

Step 2: Determine Subarea Employment Forecasts

The methodology used to forecast employment is based upon analysis of Woods & Poole forecasts by county. Woods & Poole employment forecasts for the four-county area were obtained. The Woods & Poole projections were collected for 2016, 2020, 2025, 2030, 2035, 2040, 2045, and 2050. The four-county projected totals were used to develop an average growth rate for each of the listed timeframes. A key assumption was that the growth rate forecasted at the county level also would be observed at the MPA level for each of the subareas.

Figure 4: Employment Projections by County

	2016	2020	2025	2030	2035	2040	2045	2050
Polk	362,100	383,090	408,056	432,710	454,430	473,890	491,570	507,530
Dallas	56,766	63,597	72,894	80,870	93,442	104,750	116,980	130,260
Madison	6,974	7,220	7,501	7,742	7,940	8,100	8,237	8,356
Warren	18,821	19,768	20,947	22,075	23,116	24,098	25,032	25,914
Totals	444,661	473,675	509,398	543,397	578,928	610,838	641,819	672,060

Source: Woods & Poole

Figure 5: County Growth Rates by Time Period

	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2044	2046-2050
Polk	1.133%	1.271%	1.180%	0.984%	0.842%	0.735%	0.641%
Dallas	2.299%	2.766%	2.098%	2.932%	2.311%	2.233%	2.174%
Madison	0.696%	0.767%	0.634%	0.506%	0.400%	0.336%	0.287%
Warren	0.987%	1.165%	1.055%	0.926%	0.836%	0.763%	0.695%
4-County Average	1.272%	1.465%	1.301%	1.275%	1.079%	0.994%	0.925%
Growth Rate for Time Period	6.361%	7.324%	6.503%	6.374%	5.394%	4.972%	4.625%

The growth rate for each time period was used to develop the employment projections for each of the seven subareas in the MPA.

Figure 6: Employment Projections by Subarea

Subarea	2016	2020	2025	2030	2035	2040	2045	2050
1	27,680	29,441	31,597	33,652	35,797	37,728	39,603	41,435
2	54,639	58,115	62,371	66,427	70,661	74,473	78,175	81,791
3	90,876	96,657	103,736	110,482	117,524	123,863	130,022	136,036
4	31,589	33,598	36,059	38,404	40,852	43,056	45,196	47,287
5	92,705	98,602	105,824	112,705	119,889	126,356	132,639	138,774
6	49,160	52,287	56,117	59,766	63,575	67,005	70,336	73,590
7	51,524	54,801	58,815	62,640	66,633	70,227	73,719	77,128
Total	398,173	423,501	454,518	484,075	514,930	542,707	569,691	596,041

The next step involved breaking each subarea down by the jurisdictions located in that subarea. For the purpose of projecting employment for each jurisdiction, it was assumed that each jurisdiction would retain its 2016 base year percentage of each subarea’s employment. Figure 7 shows the final employment projections for each jurisdiction.

Figure 7: Employment Projections by Jurisdiction

	2016 Base Year	2020	2030	2040	2050	Total Growth by Jurisdiction
Altoona	10,779	11,465	13,104	14,692	16,136	5,357
Ankeny	24,152	25,688	29,363	32,919	36,154	12,002
Bondurant	1,020	1,085	1,240	1,390	1,527	507
Carlisle	1,425	1,516	1,732	1,942	2,133	708
Clive	15,406	16,386	18,730	20,998	23,062	7,656
Des Moines	197,156	209,697	239,691	268,722	295,131	97,975
Grimes	5,565	5,919	6,766	7,585	8,330	2,765
Johnston	12,648	13,453	15,377	17,239	18,933	6,285
Mitchellville	632	672	768	861	946	314
Norwalk	2,341	2,490	2,846	3,191	3,504	1,163
Pleasant Hill	4,381	4,660	5,326	5,971	6,558	2,177
Polk City	832	885	1,011	1,134	1,245	413
Urbandale	28,048	29,832	34,099	38,229	41,986	13,938
Waukee	5,409	5,753	6,576	7,372	8,097	2,688
West Des Moines	67,946	72,268	82,605	92,610	101,711	33,765
Windsor Heights	3,441	3,660	4,183	4,690	5,151	1,710
Dallas County	452	481	550	616	677	225
Polk County	15,761	16,764	19,161	21,482	23,593	7,832
Warren County	779	829	947	1,062	1,166	387
Total	398,173	423,501	484,075	542,707	596,041	197,868

Step 3: Determine Population Forecasts by Jurisdiction

The MPO developed a methodology to project housing units using data from the U.S. Census Bureau. Housing unit data from the 2000 Census and 2016 Census Estimate was collected and compared to determine an average annual growth rate over the 16-year period for each of the MPO jurisdictions.

Figure 8: Housing Unit Growth Rates by Jurisdiction

	2000	2016	Growth Rate (%)	Growth Rate Category
Altoona	3,959	6,374	3.02	Low
Ankeny	10,339	21,261	4.61	High
Bondurant	682	1,693	5.85	High
Carlisle	1,379	1,635	1.07	Low
Clive	4,902	6,788	2.06	Low
Des Moines	85,067	90,437	0.38	Low
Grimes	1,958	3,733	4.12	High
Johnston	3,406	8,070	5.54	High
Mitchellville	675	684	0.08	Low
Norwalk	2,382	3,813	2.98	Low
Pleasant Hill	1,966	3,788	4.18	High
Polk City	842	1,389	3.18	High
Urbandale	11,869	17,066	2.30	Low
Waukee	2,087	6,470	7.33	High
West Des Moines	20,815	28,298	1.94	Low
Windsor Heights	2,222	2,161	-0.17	Low
Dallas County	n/a	n/a	0.87	n/a
Polk County	n/a	n/a	0.87	n/a
Warren County	n/a	n/a	0.87	n/a
MPA	n/a	n/a	3.03	n/a
Low Growth Avg.	n/a	n/a	1.52	n/a

The MPO jurisdictions were divided into two growth categories – high growth and low growth. A jurisdiction was considered high growth if its growth rate was higher than the growth rate for the MPA. All other jurisdictions fell into the low-growth category. An average growth rate was also developed for the low-growth category. The average annual growth rate was used to calculate the amount of annual growth that could be expected for each jurisdiction. This annual growth was used to develop a straight-line project for future housing unit growth. However, it was assumed that many of the jurisdictions would not sustain their current growth through the duration of the plan. Therefore, the housing unit projections were divided into three time periods, 2017-2029, 2030-2039, and 2040-2050.

Figure 9: Adjusted Housing Unit Growth by Time Period

	Growth Rate 2017-2029	Annual Growth 2017-2029	Growth Rate 2030-2039	Annual Growth 2030-2039	Growth Rate 2040-2050	Annual Growth 2040-2050
Altoona	3.02%	193	3.02%	193	1.52%	97
Ankeny	4.61%	980	3.03%	644	1.52%	323
Bondurant	5.85%	99	3.03%	51	1.52%	26
Carlisle	1.07%	17	1.07%	17	1.07%	17
Clive	2.06%	140	2.06%	140	1.52%	103
Des Moines	0.38%	347	0.38%	347	0.38%	347
Grimes	4.12%	154	3.03%	113	1.52%	57
Johnston	5.54%	447	3.03%	244	1.52%	122
Mitchellville	0.08%	1	0.08%	1	0.08%	1
Norwalk	2.98%	114	2.98%	114	1.52%	58
Pleasant Hill	4.18%	158	3.03%	115	1.52%	57
Polk City	3.18%	44	3.03%	42	1.52%	21
Urbandale	2.30%	392	2.30%	392	1.52%	259
Waukee	7.33%	474	3.03%	196	1.52%	98
West Des Moines	1.94%	548	1.94%	548	1.52%	429
Windsor Heights	-0.17%	(4)	-0.17%	(4)	-0.17%	(4)
Dallas County	0.87%	14	0.87%	14	0.87%	14
Polk County	0.87%	82	0.87%	82	0.87%	82
Warren County	0.87%	12	0.87%	12	0.87%	12

In the 2017-2029 time period, the average growth rate from 2000-2016 was used for each jurisdiction. In the subsequent time periods, adjustments were made to reduce the growth rate for some jurisdictions. In the 2030-2039 time period, the growth rate was reduced to the MPA rate of 3.03 percent for the jurisdictions in the high-growth category. In the 2040-2050 time period, the growth rate was reduced to the Low-Growth Average of 1.52 percent for the jurisdictions with growth rates higher than the Low-Growth Average.

Figure 10: Housing Unit Projections by Jurisdiction

	2016 Base Year	2020	2030	2040	2050	Total Growth by Jurisdiction
Altoona	7,238	8,008	9,934	11,764	12,731	5,493
Ankeny	25,516	29,436	38,899	45,017	48,243	22,727
Bondurant	2,088	2,484	3,426	3,913	4,170	2,082
Carlisle	1,689	1,759	1,934	2,109	2,284	595
Clive	7,041	7,599	8,994	10,353	11,383	4,342
Des Moines	95,044	96,431	99,897	103,364	106,831	11,787
Grimes	5,127	5,742	7,237	8,311	8,878	3,751
Johnston	8,347	10,135	14,403	16,725	17,949	9,602
Mitchellville	767	769	775	781	786	19
Norwalk	4,461	4,916	6,054	7,136	7,714	3,253
Pleasant Hill	3,984	4,618	6,159	7,249	7,824	3,840
Polk City	1,779	1,956	2,395	2,795	3,005	1,226
Urbandale	17,666	19,233	23,151	26,936	29,526	11,860
Waukee	8,133	10,029	14,492	16,354	17,336	9,203
West Des Moines	29,061	31,255	36,739	42,104	46,398	17,337
Windsor Heights	2,330	2,315	2,277	2,240	2,202	(128)
Dallas County	1,625	1,681	1,822	1,963	2,104	479
Polk County	9,453	9,781	10,600	11,420	12,240	2,787
Warren County	1,386	1,434	1,554	1,674	1,795	409
Total	232,735	249,581	290,744	322,207	343,398	110,663

The Woods & Poole population projection for 2050 is 822,886 for the four-county level. This number was used as a control target with an objective of keeping the MPA population projection below the four-county total. Specific household size and vacancy rate for each jurisdiction were taken from the 2010 Census and used to convert the projected housing units to a population number that could be compared to the Woods & Poole projection for 2050. The converted MPA population number for 2050 is 810,294. This meets the objective of staying under the Woods & Poole four-county level projection.

Step 4: Meet with Jurisdictions to Allocated Growth

Each jurisdiction used its control total from Steps 2 & 3 to allocate growth through the region. To aid in this process, the MPO staff used the scenario planning software Envision Tomorrow. Envision Tomorrow is a free tool that integrates an ArcGIS mapping extension with Microsoft Excel files. The user is able to “paint” areas on a map with different land uses. Each land use can contain different building types and development densities, which are then used to calculate population and employment growth.

MPO staff set up a template for each community and worked with the MPO’s Planning Subcommittee to develop general land uses for each community to use. MPO staff also set up a geodatabase built off county assessor records. As noted in the discussion of geography earlier in document, a one-acre grid was placed over the parcel map which resulted in the subdivision of some parcels in order to keep parcel sizes at around one acre. Constrained land uses also were identified based on sensitive area information collected through The Tomorrow Plan’s development which would not allow them to be developed.

MPO staff then met with representatives from most all communities to identify areas of growth and/or redevelopment within their jurisdictions. Community representatives were able to “paint” development or redevelopment until their allotment of growth was expended. In some cases, communities could exceed their projected allotment based on their intimate knowledge of growth in their community. Due to this factor, staff set an allocation target not to exceed the projected numbers by more than 5 percent. Figure 11 shows the per acre housing unit/employment densities used for each of the development patterns.

Figure 11: Housing and Employment Densities by Development Type

	Housing Unit/Gross Acre	Jobs/Gross Acre
CBD Urban Residential	16.4	-
Urban Residential	8.2	-
Suburban Residential	4.1	-
Rural Residential	0.6	-
Retail	-	12.8
CBD Office	-	141.9
Office	-	27.1
Industrial	-	12.3
Public/Civic	-	27.1
Education	-	27.1
Hotel/Hospitality	-	17.2
Downtown Node	36.3	16.4
Regional Node	65.4	16.4
Community Node	24.5	16.4
Neighborhood Node	14.7	16.4

Figure 12 shows the final allocated growth for housing and employment for each of the jurisdictions. Dallas County and Warren County show no growth as it was assumed that the growth areas in these counties would fall into areas taken up by the future expansion of the municipalities.

Figure 12: Allocated Housing and Employment by Jurisdiction

	Total Housing Unit Growth	Total Employment Growth
Altoona	5,509	5,396
Ankeny	22,878	12,069
Bondurant	4,640	1,508
Carlisle	595	832
Clive	3,260	3,792
Des Moines	13,663	100,022
Grimes	3,959	3,543
Johnston	9,642	6,333
Mitchellville	18	313
Norwalk	3,319	3,371
Pleasant Hill	3,847	2,191
Polk City	1,222	410
Urbandale	12,319	14,087
Waukee	10,470	7,108
West Des Moines	17,469	34,187
Windsor Heights	70	1,341
Dallas County	-	-
Polk County	2,883	8,424
Warren County	-	-
Total	115,763	204,927

Figure 13 shows a comparison of projected housing and employment compared to the final allocated growth. The final allocated growth totals for housing and employment stayed below the 5 percent target threshold.

Figure 13: Projected vs. Allocated Housing and Employment Totals

	Total Housing Unit Growth	Total Employment Growth
Projected	110,663	197,868
Allocated	115,763	204,927
Target	4.61%	3.57%

Step 5: Growth Aggregated to TAZs

Once growth for all jurisdictions was allocated for each time horizon, the parcel-based geographies were aggregated to TAZs using ArcGIS.

<<Dot density maps for each of the time periods>>

Population Forecasts

Staff also developed population forecasts. These forecasts were used for illustrative purposes when discussing the growth scenario with the Long-Range Plan Steering Committee. The population numbers were derived using household size and vacancy rates from the 2010 U.S. Census. These rates were applied to the number of housing units from the 2016 base parcel file to determine the 2016 population for each jurisdiction listed in Figure 14.

Figure 14: Base Population Calculations

	Household Size	Vacancy Rate	2016 Population
Altoona	2.64	4%	18,294
Ankeny	2.58	5%	62,579
Bondurant	2.83	4%	5,660
Carlisle	2.57	3%	4,198
Clive	2.68	5%	17,867
Des Moines	2.43	8%	211,799
Grimes	2.65	5%	12,935
Johnston	2.67	4%	21,448
Mitchellville	2.53	6%	1,823
Norwalk	2.7	5%	11,385
Pleasant Hill	2.57	5%	9,691
Polk City	2.73	3%	4,689
Urbandale	2.52	4%	42,546
Waukee	2.67	4%	20,811
West Des Moines	2.32	7%	62,515
Windsor Heights	2.24	5%	4,941
Dallas County	2.58	7%	3,916
Polk County	2.58	7%	22,782
Warren County	2.58	7%	3,340
Total			543,219

The same calculations were applied to the allocated housing units from Figure 12 to determine population growth for each time period of the plan and total growth for each jurisdiction. The 2016 population from Figure 14 was added to the total growth to determine the total population in 2050 shown in Figure 15.

Figure 15: Population Projections

	2020	2030	2040	2050	Total Growth by Jurisdiction	Total Population 2050
Altoona	2,659	4,180	4,719	2,366	13,924	32,218
Ankeny	10,060	23,213	14,929	7,907	56,109	118,688
Bondurant	1,220	11,357	-	-	12,577	18,237
Carlisle	169	442	428	440	1,479	5,677
Clive	1,520	3,624	3,129	-	8,272	26,139
Des Moines	6,576	7,443	11,160	5,268	30,447	242,246
Grimes	1,642	3,825	2,629	1,892	9,988	22,923
Johnston	2,896	10,430	8,171	3,279	24,776	46,223
Mitchellville	5	14	14	10	43	1,866
Norwalk	4,168	2,450	1,273	579	8,470	19,855
Pleasant Hill	1,581	3,705	2,646	1,425	9,358	19,048
Polk City	493	1,126	1,078	525	3,221	7,910
Urbandale	4,345	9,024	9,157	7,143	29,669	72,214
Waukee	5,048	11,893	5,102	4,747	26,791	47,601
West Des Moines	4,857	11,933	11,296	9,493	37,579	100,094
Windsor Heights	148	-	-	-	148	5,089
Dallas County	-	-	-	-	-	3,916
Polk County	799	2,037	2,051	2,030	6,917	29,699
Warren County	-	-	-	-	-	3,340
Total	48,187	106,696	77,782	47,103	279,768	822,987