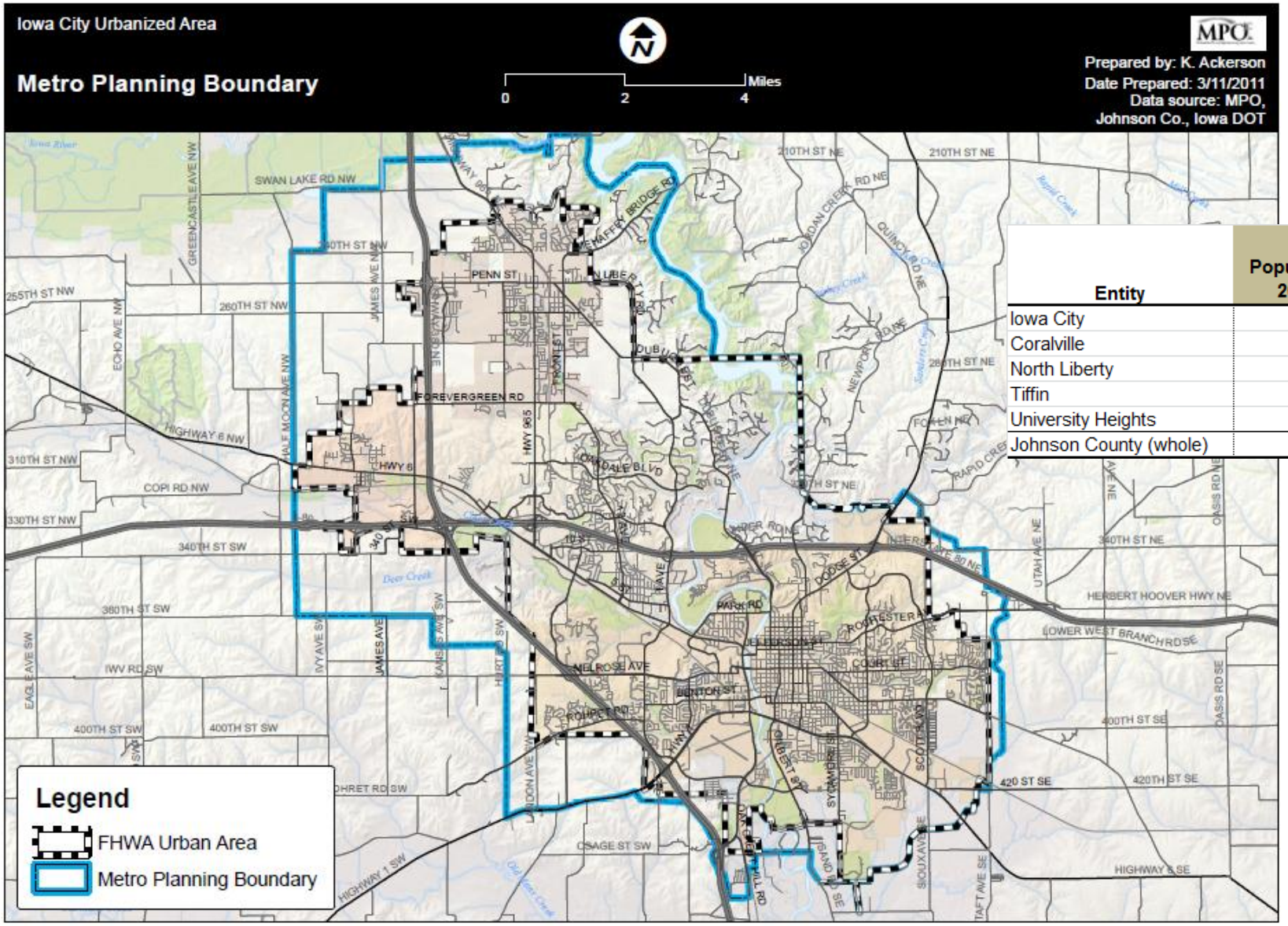
Forecasting socio-economic data for MPOJC's 2040 Travel Demand Model

Background

- MPOJC finalizing 2040 Long Range Transportation Plan in May 2012
- 2010 and 2040 Travel Demand Models with LRTP
- DOT Systems Planning Staff supported model creation and calibration;
- MPO staff responsible for forecasting socio-economic data for future model; received TAZ file with 2010 base
- With the last model update (2035) communities provided SE forecasts – some communities were very optimistic about growth! In 2040 we took a different approach……

MPOJC Entities



Entity	Population 2010
Iowa City	67,862
Coralville	18,907
North Liberty	13,374
Tiffin	1,947
University Heights	1,051
Johnson County (whole)	130,882

Historical MPO Census Population Data

Area	State	Johnson County	Iowa City	Coralville	North Liberty	Tiffin	University Heights	Metro Population	Non Metro Pop
1840	43,112	1,488							
1850	192,214		1,250					1,250	
1860	674,913	***17,889***	5,214					5,214	
1870	1,194,020		5,914					5,914	
1880	1,624,615		7,123	347				7,470	
1890	1,912,297		7,016	173				7,189	
1900	2,231,853	24,817	7,987	125				8,112	16,705
1910	2,224,771	25,914	10,091	151		176		10,418	15,496
1920	2,404,021	26,462	11,267	150	171	178		11,766	14,696
1930	2,470,939	30,276	15,340	254	161	206		15,961	14,315
1940	2,538,268	33,191	17,182	433	282	240	261	18,398	14,793
1950	2,621,073	45,756	27,212	977	309	256	446	29,200	16,556
1960	2,757,537	53,663	33,443	2,357	334	311	841	37,286	16,377
1970	2,825,368	72,127	46,850	6,130	1,055	299	1,265	55,599	16,528
1980	2,913,808	81,717	50,508	7,687	2,046	413	1,069	61,723	19,994
1990	2,776,831	96,119	59,735	10,347	2,926	460	1,042	74,510	21,609
2000	2,926,324	111,006	62,220	15,123	5,367	975	987	84,672	26,334
2010	3,046,355	130,882	67,862	18,907	13,374	1,947	1,051	103,141	27,741
Year 2000 - 2010									
Growth	4.10%	17.91%	9.07%	25.02%	149.19%	99.69%	6.48%	21.81%	5%
Avg Ann	4%	1.8%	0.9%	2.5%	14.9%	10.0%	0.6%	2.2%	0.5%
% of Urbanized Area			65.8%	18.3%	13.0%	1.9%	1.0%	100.0%	26.9%

Developing plan of attack

Outside of using a crystal ball, how does one go about determining what the future will look like in terms of housing and employment across the entire metro area?

- **STEP 1**: Developed control totals for both housing and employment data based on growth trends
- **STEP 2**: Distributed growth to each TAZ across the model
- **STEP 3**: Verified with communities/check for reasonableness

Big Assumptions!!

- **ASSUMPTION #1 –** That population growth will occur in MPOJC area
- **ASSUMPTION #2 –** The rate at which the population will grow (linearly)
- **ASSUMPTION #3 –** Each MPO entity's *employment / population* rates and *population / housing* rates will be the same in 2040 as in 2010
- **ASSUMPTION #4 –** Each MPO will have approximately the same share of employment types in 2040 v. 2010 (e.g. retail vs service vs production/distribution)

STEP 1

Developing control totals

A control total is a reasonable estimate for growth at some point in future, typically based on statistical growth trends.

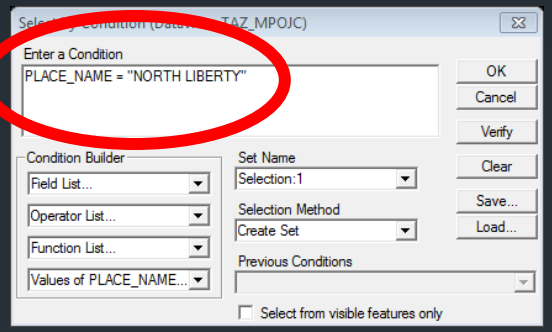
1) **Develop 2040 linear population projections**

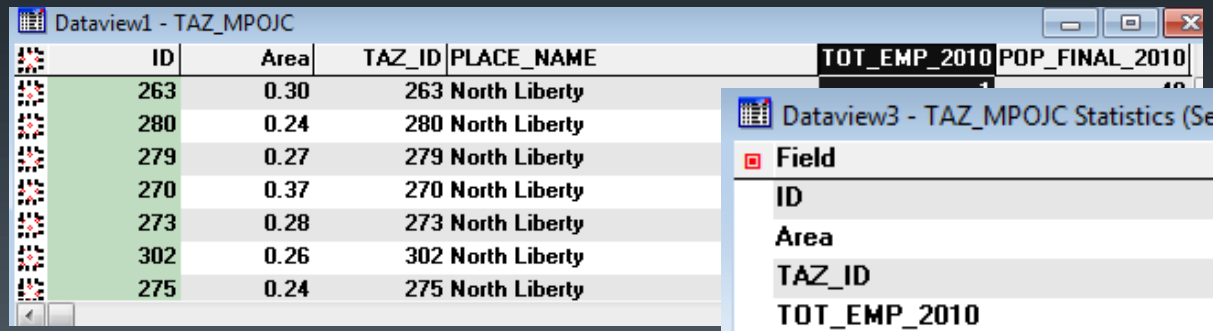
   MPOJC used 1990, 2000, and 2010 census data

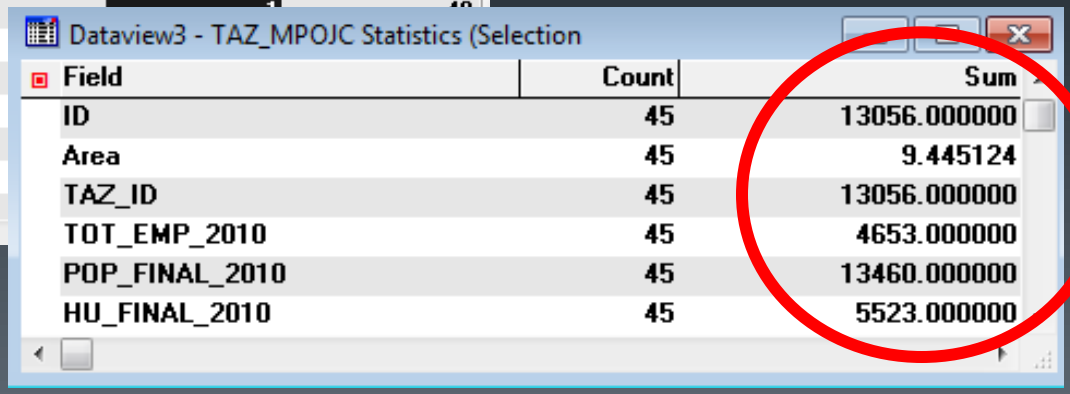
Entity	Population 2010	Linear Population Proj 2040
Iowa City	67,862	79,500
Coralville	18,907	31,900
North Liberty	13,374	28,100
Tiffin	1,947	4,100
University Heights	1,051	1,000
Johnson County (whole)	130,882	182,200

Developing employment control totals….

2) **Calculate 2010 *employment / population* ratios for each community & total MPO using base model TAZ file**
   - Selection -> Select by Condition
   - Select by community
   - Open selection dataview
   - Click “compute statistics”







Developing employment control totals….

3) **Apply *employment / population* ratio to *new* forecasted 2040 population to determine 2040 total employment control total**

EXAMPLE: Iowa City

Entity	2010 Empl / Pop Ratio
Iowa City	0.77
Coralville	0.76
North Liberty	0.34
Tiffin	0.13
University Heights	0.10
Johnson County (in model)	0.14
Totals (Entire Model)	0.65

.77 * 68,248 = 61,215

Iowa City's Empl/Pop Ratio

Iowa City's 2040 pop projection

Est'd Total IC 2040 Employees (Control Total)

Developing employment control totals….

Retail
Service
Prod/Dist
Unclassed

4) **Developed control totals by employee type**
   - Calculated % for each empl type by MPO entity in 2010
   - Applied the % to the forecasted 2040 total employment for each MPO entity to

Entity	Model Empl 2010	Retail Empl 2010	Retail %	Service Empl 2010	Service %	Prod/Dist 2010	Prod/Dist %	Unclassed 2010	Unclassed %
Iowa City	52,234	11,15	21%	33,834	65%	7,196	14%	47	0%
Coralville	14,409	3,4	24%	7,923	55%	3,052	21%	27	0%
North Liberty	4,560	4 6	9%	1,920	42%	2,199	48%	25	1%
Tiffin	257	3	9%	161	63%	71	28%	2	1%
University Heights	107	2	2%	25	23%	10	9%	-	0%
Johnson County (in model)	1,291	8	7%	765	59%	430	33%	12	1%
Totals (Entire Model)	72,858	15,089	21%	44,628	61%	12,958	18%	113	0%

Entity	Empl Proj 2040	Retail Empl 2040	Service Empl 2040	Prod/Dist 2040	Unclassed 2040
Iowa City	61,215	13,075	39,651	8,433	55
Coralville	24,244	5,732	13,331	5,135	45
North Liberty	9,554	872	4,023	4,607	52
Tiffin	533	48	334	147	4
University Heights	100	2	23	9	-
Johnson County (in model)	1,494	97	885	498	14
Totals (Entire Model)	97,140	20,11	59,502	17,277	151

Developing housing control totals….

5) **Calculate 2010 *population / housing unit* ratio for each MPO entity using TAZ file**
   - **Calculated % for each empl type by MPO entity in 2010**
   - **Applied the % to the forecasted 2040 total employment for each MPO entity to**

EXAMPLE: Iowa City:

68,248 / 29,388 = 2.32

2010 Pop / HU ratio

Iowa City's 2010 Model Pop

Iowa City's 2010 Housing Units

Entity	Model Pop 2010	Housing Units 2010	Pop / HU 2010
Iowa City	68,248	29,388	2.32
Coralville	18,893	8,310	2.27
North Liberty	13,287	5,740	2.31
Tiffin	1,988	866	2.30
University Heights	1,051	512	2.05
Johnson County (in model)	9,092	3,855	2.36
Totals (Entire Model)	112,559	48,671	2.31

Developing housing control totals….

each
MPO en

6) **Apply 2010 *population / housing unit* ratios to 2040 projected population for each MPO entity**

EXAMPLE: Iowa City

2.32 / 79,500 = 34,233

Iowa City's 2010 Housing / Pop ratio

Iowa City's 2040 pop projection

Iowa City's 2040 Housing Unit projection (Control Total)

Entity	HU 2040
Iowa City	34,233
Coralville	14,031
North Liberty	12,139
Tiffin	1,786
University Heights	487
Johnson County (in model)	4,463
Totals (Entire Model)	67,077

Ta-da! Control totals developed! Now what?

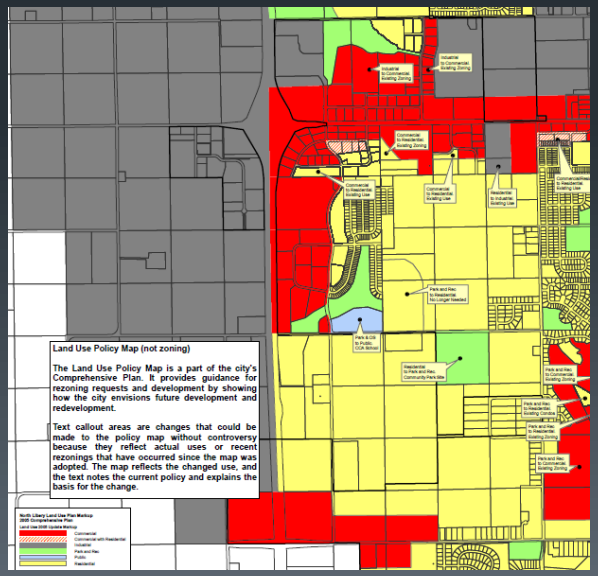
2040 Control Totals

Entity	Pop Proj 2040	Empl Proj 2040	HU Proj 2040
Iowa City	79,500	61,215	34,233
Coralville	31,900	24,244	14,031
North Liberty	28,100	9,554	12,139
Tiffin	4,100	533	1,786
University Heights	1,000	100	487
Johnson County (in model)	10,525	1,494	4,463
Totals (Entire Model)	155,125	97,140	67,077

STEP 2

Distributing “growth” into TAZs

1) **Gather your tools**
   - Aerial maps (to determine open space availability)
   - Comprehensive plans for each community
   - Zoning maps
   - Land use maps/plans
   - Year 2035 model TAZ file
   - GIS Property ownership database
   - Housing density (HU/acre) information
   - Your local knowledge
   - Coffee, lots of coffee



Distributing “growth” into TAZs

2) **Determine the difference between 2035 total employment and housing units and 2040 projections (control totals)**

EXAMPLE: Iowa City

2035 Model HU	2040 Control Ttl		Difference
12,000	14,031	=	2,031

Approx. this many more households need to be added into the model for Coralville

Repeat this step for total employment and employment types

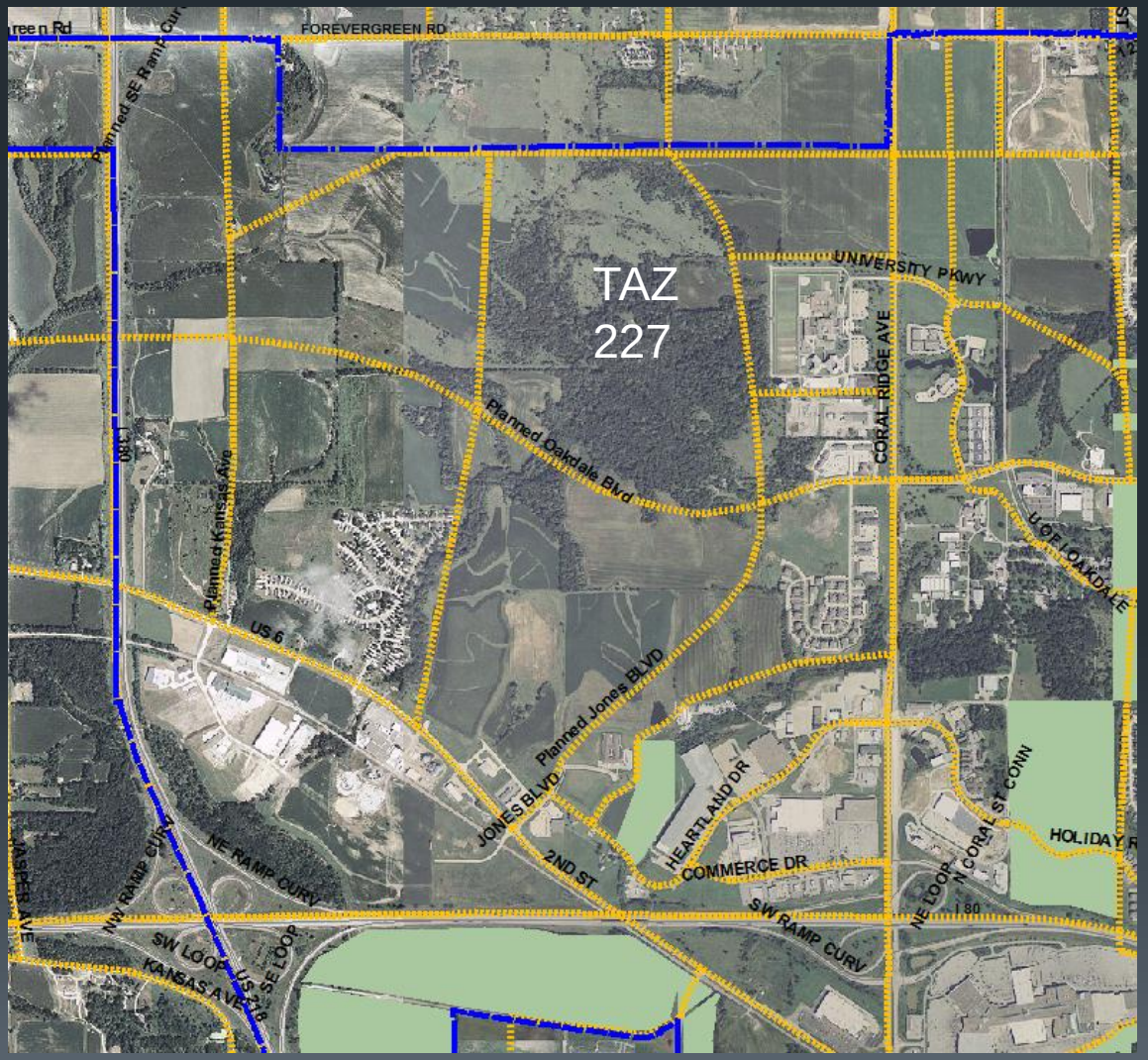
Distributing “growth” into TAZs

3) Determine what TAZs are likely to experience growth.

- Determine which TAZs are likely to be commercial, residential, or a mix in 2040 – use your tools
  - Aerial maps (to determine open space availability)
  - Comprehensive plans for each community
  - Zoning maps
  - Land use maps/plans
  - Year 2035 model TAZ file
  - GIS Property ownership database
  - Housing density (HU/acre) information
  - Your local knowledge

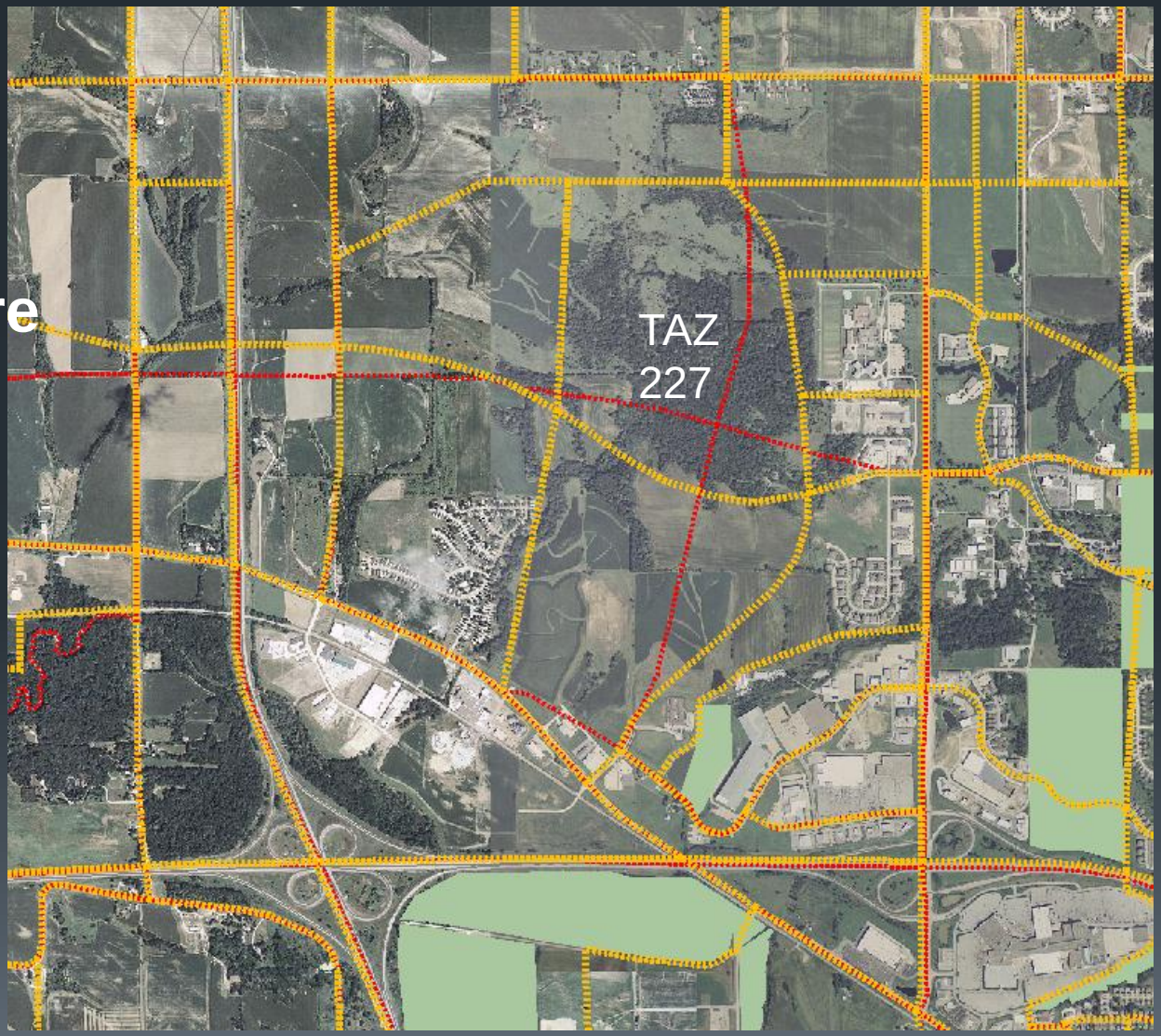
Distributing “growth” into TAZs

EXAMPLE:
Coralville



Distributing “growth” into TAZs

Look at your previous TAZ structure (2035). How many HU/employees were projected at that time?

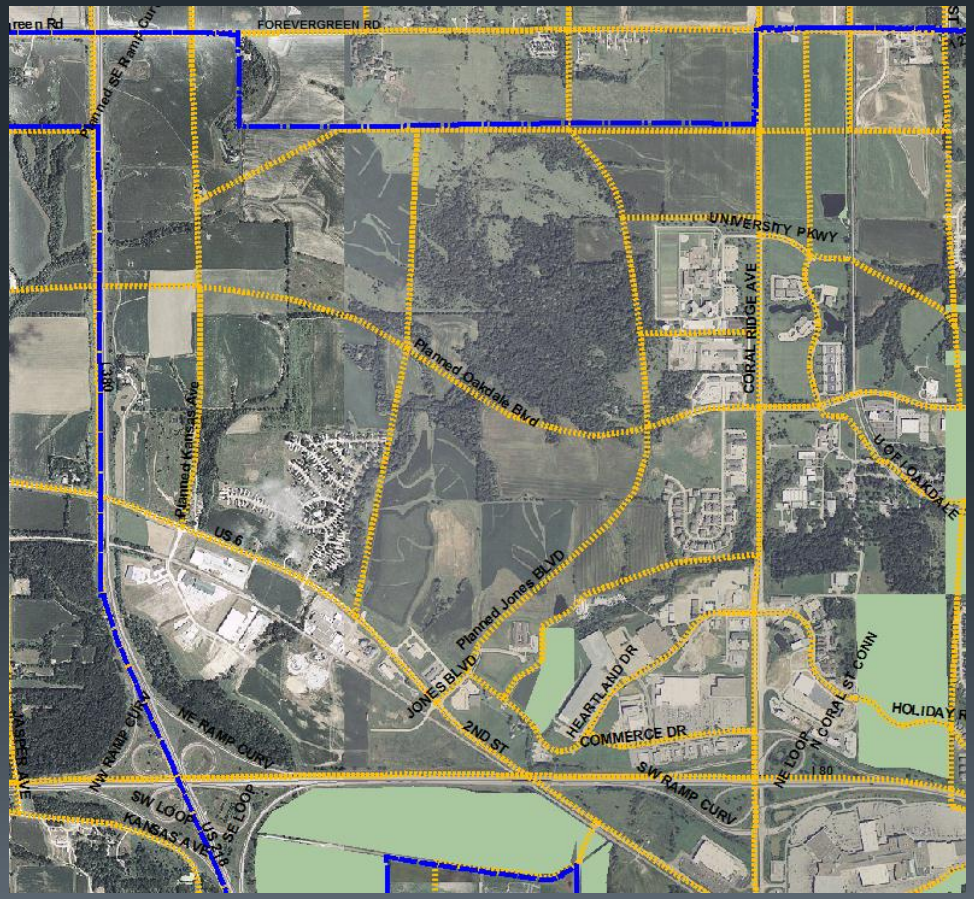


2035 TAZ
2040 TAZ

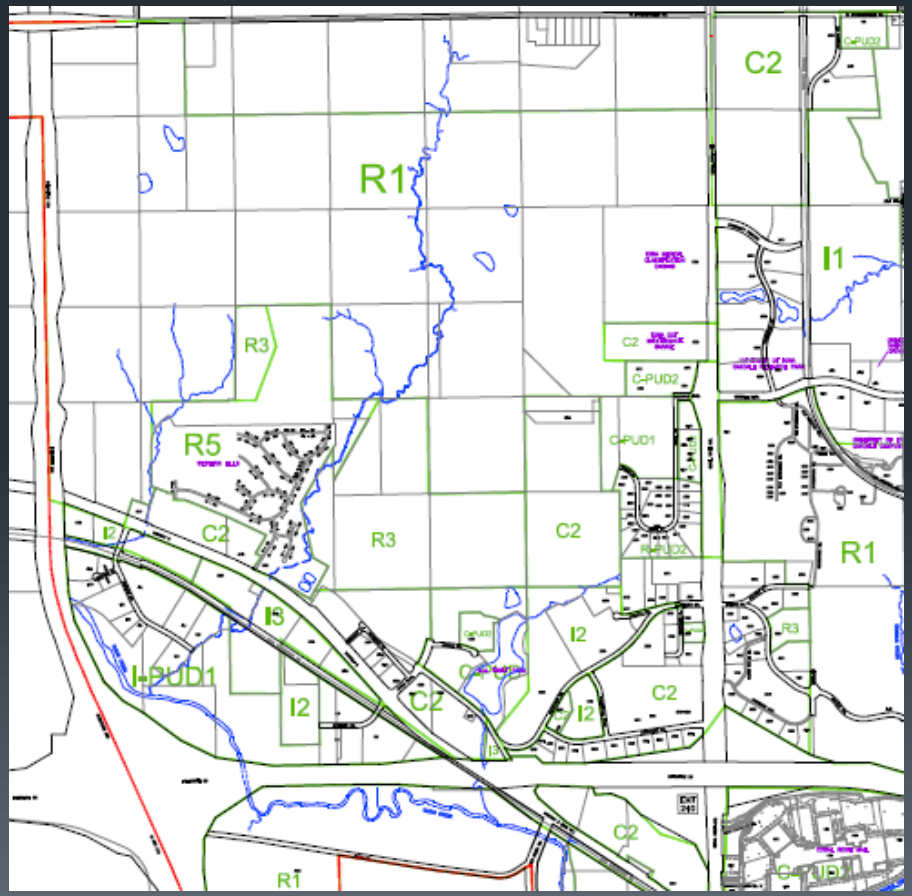
Distributing “growth” into TAZs

Coralville

TAZs



Zoning Code



Distributing “growth” into TAZs

2010

Housing - 0

Ttl Empl – 0

Retail – 0

Service – 0

Prod/Dist – 0

Unclassed – 0

2040

Housing - 820

Ttl Empl – 50

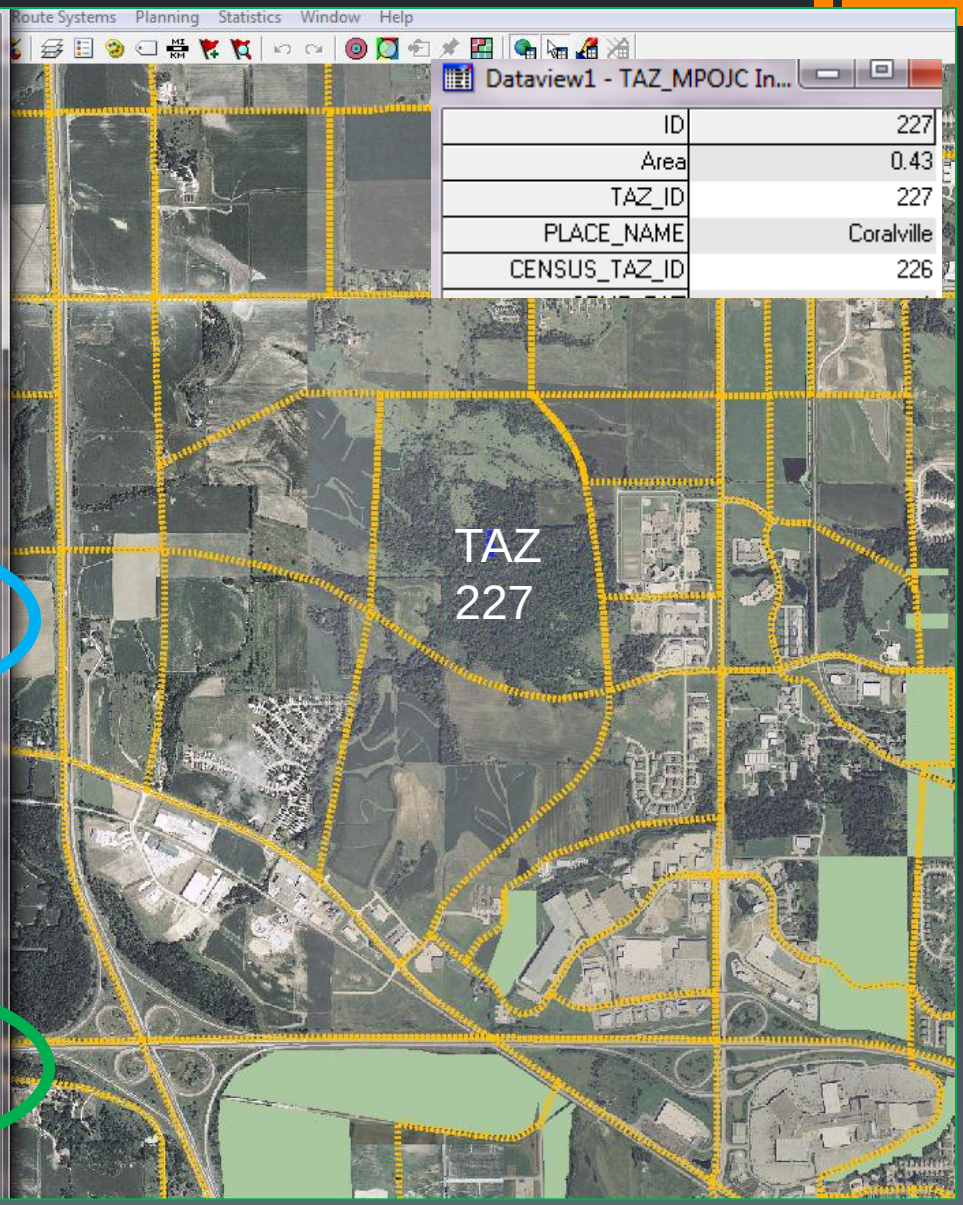
Retail – 20

Service – 30

Prod/Dist – 0

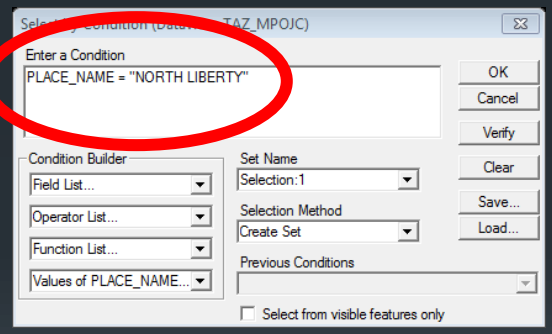
Unclassed - 0

ID	227
HU_FINAL_2010	0
POP_FINAL_2010	0
ORIG_HU_FINAL_2010	0
POP_FINAL_2020	2020
HU_FINAL_2020	2020
POP_FINAL_2030	2030
HU_FINAL_2030	2030
POP_FINAL_2040	0
HU_FINAL_2040	820
BLD_TYPE	1
BLD_TYPE_CEN	50
HU_DIST	11.14
[Check POP/HU]	0
HAS_A_UNIV_BUILDING	0
UNIV_EMP_2010	0
UP_SERVICE_EMP_2010	--
TOT_EMP_2010_DOT	0
/DIST_EMP_2010_DOT]	0
RETAIL_EMP_2010_DOT	0
RVICE_EMP_2010_DOT	0
ETAIL_EMP_2010_DOT]	0
TOT_EMP_2010	0
ROD/DIST_EMP_2010]	0
RETAIL_EMP_2010	0
SERVICE_EMP_2010	0
ON-RETAIL_EMP_2010]	0
UNCLASSED_EMP_2010	0
TOT_EMP_2020	2020
PROD/DIST_EMP_2020]	2020
RETAIL_EMP_2020	2020
SERVICE_EMP_2020	2020
ION-RETAIL_EMP_2020]	2020
UNCLASSED_EMP_2020	2020
TOT_EMP_2030	2030
PROD/DIST_EMP_2030]	2030
RETAIL_EMP_2030	2030
SERVICE_EMP_2030	2030
ION-RETAIL_EMP_2030]	2030
UNCLASSED_EMP_2030	2030
TOT_EMP_2040	50
PROD/DIST_EMP_2040]	0
RETAIL_EMP_2040	20
SERVICE_EMP_2040	30
ON-RETAIL_EMP_2040]	30
UNCLASSED_EMP_2040	0
AREA_TYPE_AERIAL	3
AREA_TYPE	4



Distributing “growth” into TAZs

4) **Enter 2040 HU & Employment data into model for each TAZ, one community at a time (coffee time!!)**
5) **Summarize dataview by community to verify if you are near your control totals**



Dataview1 - TAZ_MPOJC

ID	Area	TAZ_ID	PLACE_NAME	TOT_EMP_2010	POP_FINAL_2010
263	0.30	263	North Liberty	1	48
280	0.24	280	North Liberty	1	3
279	0.27	279	North Liberty	11	60
270	0.37	270	North Liberty	475	337
273	0.28	273	North Liberty		
302	0.26	302	North Liberty		
275	0.24	275	North Liberty		

Dataview3 - TAZ_MPOJC Statistics (Selection

Field	Count	Sum
ID	45	13056.000000
Area	45	9.445124
TAZ_ID	45	13056.000000
TOT_EMP_2010	45	4653.000000
POP_FINAL_2010	45	13460.000000
HU_FINAL_2010	45	5523.000000

STEP 3

Is the 2040 socio-economic forecast reasonable? Verify with communities

- **Contacted each MPO entity**
- **Provided 2040 HU, Empl #'s and info on how MPO arrived at these numbers**
- **Offered to provide TAZ by TAZ breakout**
- **Offered to meet and discuss**

Snafus…..

- **What if linear growth rates for a community do not seem reasonable from the get go?**
- **What if a community is not on board with HU/empl projections?**

Questions?

Darian Nagle-Gamm

Traffic Engineering Planner

MPOJC

darian-nagle-gamm@iowa-city.org