REVISED – 1/09/08

A G E N D A

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METRO

Metro's Infrastructure Advisory Committee
Meeting Agenda
January 11, 2008 10 a.m. – 12 p.m.
Council Annex, Metro Regional Center

Time	Item	Presenter
10 a.m.	Welcome and introductions	Robin McArthur
10:10 a.m.	Preliminary infrastructure needs • Analysis of information provided in questionnaires (purpose: help identify needs and existing funding) - *Is the information presented in a way that helps identify issues, challenges, and opportunities for each infrastructure type?* - *Are there recommendations for specific information to focus on for further follow up?* • Options for sub-regional analysis (purpose: Workshop #2 small group discussions; way to analyze infrastructure needs) - *Does the consultant proposal for sub-regions make sense?*	Malu Wilkinson Steve Faust Arnold Cogan
11:10 a.m.	Preliminary analysis of infrastructure costs • Assumptions/estimates - *Gut reactions to assumptions that go into the estimates of demand and costs. Do they make sense?* - *We only want enough information to identify the challenge we are facing, the gaps to address it, so that we can begin to identify a menu of solutions. Is the data presented, with your comments incorporated, sufficient for this purpose?* • Comparative costs - *Update on case study approach and progress*	Todd Chase
11:50 a.m.	Next steps for the analysis	Todd Chase
12 noon	Adjourn	Robin McArthur

Next meeting topics:
- Workshop #2
- Preliminary gap analysis

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ENVIRONMENTAL PROJECT MANAGEMENT
GOVERNMENTAL/COMMUNITY RELATIONS

MEMORANDUM

DATE: January 4, 2008

TO: Infrastructure Advisory Committee

FROM: Arnold Cogan, FAICP

RE: **Sub-region recommendations**

Metro staff asked the consultant team to propose different ways in which the region could be divided into sub-regions for purposes of organizing data and discussing common issues and coordination opportunities at the next service provider workshop. The following memo describes four ways in which sub-regions could be created and discusses the advantages and disadvantages of each.

1. Jurisdictions Grouped by Proximity

This approach is recommended by the consultant team. Sub-regions would be created by grouping jurisdictions based on their proximity to each other.

West sub-region – Forest Grove, Cornelius, Hillsboro, Beaverton, Tigard, Tualatin, Sherwood and Washington County service providers

South sub-region – Lake Oswego, West Linn, Oregon City, Gladstone, Johnson City, Milwaukie and related Clackamas County service providers

East sub-region – Happy Valley, Damascus, Gresham, Fairview, Wood Village, Troutdale and related Clackamas County service providers

Wilsonville service providers would participate in the south or east sub-region as they deem appropriate. Likewise, Portland service providers would participate where most appropriate or in all three sub-regions.

Advantages

The advantage of this approach is that municipalities are grouped into multiple sub-regions, are relatively easy to create and people are relatively familiar with the areas.

Disadvantages

Special district service providers may be divided into multiple sub-regions.

2. Political Boundaries

This approach is similar to the first, but would result in more sub-regions. In other words, municipalities would be grouped with their service providers and any adjacent municipalities served by the same service providers.

Advantages
The advantage to this approach is that neither municipalities nor other service providers are divided into multiple sub-regions.

Disadvantages
More sub-regions results in a limited ability to discuss additional opportunities for coordination.

3. Geography; Natural Boundaries
This approach would create sub-regions according to geography or topography, such as watersheds and drainage basins. Sub-regions also could be created using natural boundaries such as the Willamette River, Sandy River, Clackamas River, West Hills, etc.

Advantages
Services such as sanitary and storm sewer systems are related to geography.

Disadvantages
Sub-regions will cut across municipalities.

4. Linear, Man-made Infrastructure Elements
This approach would create sub-regions according to linear, man-made infrastructure elements such as I-5, I-205, Sandy Boulevard, Barbur Boulevard, etc.

Advantages
Municipalities along these infrastructure elements have similar issues.

Disadvantages
Sub-regions will cut across municipalities.

Memorandum

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To:	Arnold Cogan & Steve Faust – Cogan Owens Cogan
From:	Scott Shumaker
Copies:	Amanda Owings - Otak
Date:	December 31, 2007
Subject:	**Metro Infrastructure Service Consumption Research Task 2.3a.**
Project No.:	14488

A portion of Task 2.3a. is to provide analysis regarding infrastructure service demands based on a population or housing unit basis. The summary below is the information obtained to date by Otak. The data is incomplete as some of the listed infrastructure items do not appear to have statistical demand data available. The summary on this page lists the demand values that Otak has deemed to be a reliable average of the data that was obtained. The background information for this summary analysis is located on the following pages of this memorandum.

Metro Infrastructure Service Consumption Research Summary

- **Local Roads & Bridges:** N/A
- **Sanitary Sewer: 80 GPCD**(Residential-gallons per capita per day); **1,500 GPAD**(Commercial Low density-gallons per acre per day); **3,000 GPAD**(Commercial High density-gallons per acre per day); **1,000 GPAD**(Infiltration & Inflow (I&I)-gallons per acre per day))
- **Water: 115 GPCD**(gallons per capita per daily consumption)
- **Storm Water:** N/A. This infrastructure item is not related to consumption.
- **Energy (Electricity): 305 Million BTU**(Total energy per capita per year). This includes all uses.
- **Transit:** N/A
- **Urban Parks & Greenspaces: 15 acres per 1,000 residents**
- **Parking Facilities:** N/A. Requirements available based on very detailed Land use information. See background information.
- **Schools (Public): # of Primary Schools =>(0.00022 x Total Pop.); # of Middle Schools =>(0.000058 x Total Pop.); # of High Schools =>(0.000049 x Total Pop.).** The data seems to suggest that a highly urban district such as Portland has a much lower student age population than represented here and adjustments should be made in these types of districts. See background information for Schools Per Capita assumptions.
- **Civic Buildings (Library): 3,050 square feet for the first 4,000 population and 0.76 square feet per capita in excess of 4,000 population**(For Populations 0-50,000**); 38,750 square feet for the first 50,000 and 0.61 square feet per capita**(For Populations in excess of 50,000).

All supporting documents are saved under: Project\14400\14488\Planning

Sanitary Sewer:
West Linn: Single Family Residents 80 gpcd (See Sanitary Sewer Master Plan pg. 8-1)
Oregon City: Single Family Residents 80 gpcd, Industrial 3,000 gpcd (See Sanitary Sewer Master Plan p 3-5)

Portland Metro: variable based on land use type. (See City of Portland BES Sewer and Drainage Facilities Design Manual pg. 5-2 – 5-10). Sewer and Drainage Facilities Design Manual - Ch 5

Residential: 80gpcd; Commercial (Low-density) 1,500 gpad; Commercial (High-density) 3,000 gpad; Industrial 5,000 gpad; Infiltration & Inflow (I&I) 1,000 gpad.

Table 5.2 lists Average Daily Flow for land use types (p. 5-7). Use Eqn 5.8 and 5.9 to find Peak Daily Flow (p. 5-8) using peak flow factor found in Figure 5.1 (p. 5-9). Design example on p. 5-10.

Water:
City of Portland: 115 gallons per capita daily consumption (gpcd)
City of West Linn: 143 gpcd
Wolf Creek Highway Water District (Washington County): 124 gpcd
Metzger Water District (Washington County): 100 gpcd
Average US Single Family Resident uses 101 gpcd
(http://www.cob.org/documents/pw/utilities/20061002_water_consumption_and_water_conservation.pdf)

Storm Water:
City of Portland – Bureau of Environmental Services provides manual on hydrologic methods for designing stormwater system. These methods are rather detailed, however, and may not be appropriate. See Ch 6 of the Sewer and Drainage Facilities Design Manual for more information.
Sewer and Drainage Facilities Design Manual - Ch 6

Energy:
From U.S. Department of Energy, Energy Information Administration:
http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=OR
Oregon Energy Consumption
Population: 3.7 million people (estimate for 2006)
Total Energy per capita: 305 million BTU per year
Commercial: 207.4 trillion BTU (56.1 million BTU per capita)
Residential: 261.3 trillion BTU (70.6 million BTU per capita)
Industrial: 301.1 trillion BTU (81.4 million BTU per capita)
Transportation: 323.7 trillion BTU (87.5 million BTU per capita)

DoE, EIA: http://www.eia.doe.gov/cneaf/electricity/st_profiles/sep2006.pdf , p. 193 in pdf
Oregon Electricity Consumption
Total Population: 3.7 million people (estimate for 2006)
Total Electricity Consumed: 48,069,000 MWh
Residential – 18,978,000 MWh
Commercial – 16,083,000 MWh
Industrial – 12,991,000 MWh
Total Electricity Consumed per Capita per year: 13 MWh / person / yr

Parks:
Tualatin Hills Park and Rec: 8.5 acres per 1,000 residents
City of West Linn: 23.86 acres per 1,000 residents
City of Portland: 19.64 acres per 1,000 residents
North Clackamas Parks and Rec: 9.0 acres per 1,000 residents
Excerpt from North Clackamas Parks and Rec Master Plan page 4.11: *Comparison to Other Communities*
It is often helpful to make comparisons between communities in terms of park standards, operating budgets, existing facilities, recreation participation, and other factors. For comparison purposes, MIG analyzed four park and recreation districts in Oregon:

- *Bend Metro Park and Recreation District*
- *Chehalem Park and Recreation District*
- *Tualatin Hills Park and Recreation District*
- *Willamalane Park and Recreation District*

In addition, the service levels of 33 Oregon cities were used for comparison. The cities are listed in Appendix G. The average ratio of parkland acres to population for the 33 Oregon cities is ***14.90 acres per 1,000 population.*** *The same Oregon cities have adopted level of service standards that average* ***15.87 acres per 1,000 population.*** *The average ratio of existing parkland to population for the four park districts (listed above) used for comparison is* ***19.65 acres per 1,000 population****. The range is* ***8.5 acres per 1,000 (Tualatin Hills Park and Recreation District)*** *to* ***38 acres per 1,000 (Bend Metro Park and Recreation District).*** *Tualatin Hills Park and Recreation District has adopted a standard of 6.5 acres per 1,000 of core parkland, which includes 1 acre of neighborhood parkland, 1.5 acres community parkland, and 4 acres undesignated.*

Parking Facilities
See attachments for detailed planning info. Minimum parking spaces based on land use. These documents were included mostly for reference.
Portland Zoning Code, page 266-6: http://www.portlandonline.com/shared/cfm/image.cfm?id=53320
Table with minimum parking spaces by zone or land use
Gresham Comp Plan, pages 9.08-13 & 16-20:
http://www.ci.gresham.or.us/departments/planningServices/dp/code/article9/section908.pdf
Minimum parking spaces for auto and bike by use; very detailed.
Beaverton Development Code, page SR-106 (683 of 876):
http://www.beavertonoregon.gov/departments/CDD/Codes/development/dev_code.pdf

Schools: **Otak assumed Primary School Ave=400 students, Middle=550, High School=1300; Students Per Capita Primary=0.088, Middle=0.032, High School=0.064 to determine Students per Capita Rate.**
Washington County: (from Steve Faust e-mail)
Students per school
Elementary = 400
High School = 1,400
Students per Household
Single Family
Elementary = 0.54
High School = 0.12
Multi-family
Elementary = 0.14
High School = 0.06
Students per Capita
Source: US Census Bureau. http://quickfacts.census.gov/qfd/states/41/41067.html
Total Population = 514,300
Students per Capita = 0.186(this number calculated by taking percentage of persons under 18 years old minus percentage of persons under 5 years old)

Lake Oswego
School info from: http://www.loswego.k12.or.us/schools/schools.htm
Demographics from: http://www.city-data.com/city/Lake-Oswego-Oregon.html
Average Students per School
Primary: 360
Middle: 590
High: 1180
Schools per Capita
Total Population: 36,700
Primary: 9 schools => 0.000245
Middle: 2 schools => 0.000054
High: 2 schools => 0.000054
Students per Capita
Total Student Population: 6,700
Primary: 0.088
Middle: 0.032
High: 0.064
Total: 0.185 students per capita

Portland
(not including private or multi-level schools)
School info from: http://www.pps.k12.or.us/schools-c/map/
Portland demographics: http://www.pdc.us/bus_serv/facts-quick.asp and http://www.pps.k12.or.us/schools-c/profiles/enrollment/

Average Students per School
Primary: 430
Middle: 530
High: 1290
Schools per Capita
Total Population: 545,000
Primary: 30 schools => 0.000055
Middle: 17 schools => 0.000031
High: 12 schools => 0.000022
Students per Capita
Total Student Population: 37,600
Primary: 0.024
Middle: 0.017
High: 0.028
Total: 0.069 students per capita

Civic Buildings
Libraries
Oregon Library Association produced this table for size requirements:

Population served	Minimum space requirements
0 – 3,999	3,050 square feet
4,000 – 49,999	3,050 square feet for the first 4,000 population and 0.76 square feet per capita in excess of 4,000 population
50,000+	38,750 square feet for the first 50,000 and 0.61 square feet per capita in excess of 50,000 population

Source: http://www.olaweb.org/pld/standards_g.html

METRO

REGIONAL INFRASTRUCTURE STUDY
SERVICE PROVIDER QUESTIONNAIRE DATA SUMMARY AND ANALYSIS

Over the past few months, Metro has been collecting data from infrastructure service providers to help examine the region's long-term infrastructure needs and opportunities. The questionnaires were sent to all of the city and county managers as well as special districts and separate infrastructure service providers in the Metro region (44 total). Respondents that provide multiple services were asked to complete a separate questionnaire for each infrastructure type. Thus far, we have received 52 completed questionnaires, out of a potential 127. In the coming weeks we will follow up with service providers we have not heard from. In particular, we hope to get additional information about civic buildings and parks as well as energy provision. We also will contact service providers from whom we received incomplete information. In addition, a parallel process is underway to gather data regarding school infrastructure needs.

The following preliminary data summary and analysis is intended to provide a basic understanding of infrastructure needs and opportunities and serve as the basis for a deeper discussion of the issues. This information helps Metro assess the magnitude of the region's infrastructure needs to support the 2040 Growth Concept as we accommodate the next one million people.

Preliminary Findings

- There are commonalities, but challenges vary for different types of infrastructure
- Few responses focused on the need for civic buildings and parks, most reported on traditional "pipes and pavement" infrastructure
- Funding challenges are especially significant for non-rate-paying infrastructure types (civic buildings, parks, transportation)
- Coordination is a significant challenge for water providers
- Most service providers coordinate with adjacent service providers and see potential benefits from increased cooperation
- The politics of raising adequate funds is a common issue for all types of infrastructure

Civic Buildings

The cities of Cornelius, Gladstone, Tigard and Wood Village and Multnomah County completed questionnaires regarding civic building infrastructure. The City Hall in Wood Village doesn't adequately support existing staff and has no capacity for additional staff. The library in Cornelius is 67% below state standards and the general government building has no room for expansion. Together, the cities of Wood Village and Cornelius have approximately $9.5 million in planned capital improvements, for which less than 10% of necessary funds have been secured. The four cities identify a lack of funds as the top challenge to making capital improvements, whether it's due to a low per capita assessed value or the lack of a dedicated revenue source.

Parks

The cities of Cornelius, Hillsboro, Portland and Tigard returned questionnaires related to parks infrastructure. The City of Tigard alone has approximately $26 million in capital improvements over the next 12 years. Eighty percent of those improvements are unfunded. A lack of funding for facility operation and maintenance is listed as a major challenge to park infrastructure including an annual gap of $9.3 million in Portland. A lack of available land, the cost of land and insufficient funds from SDCs also are identified as challenges. All four municipalities use intergovernmental agreements for park facilities and services and see the opportunity for additional efficiencies through coordination with other providers. One respondent emphasizes the need for investment in green infrastructure and design-with-nature (ecosystem services) concepts. Another service provider indicated that environmental regulations greatly increase the cost of providing amenities such as trails through natural areas.

Sanitary Sewer

Eleven service providers completed questionnaires about sanitary sewer infrastructure. The amount of excess capacity varies by location. Planned capital improvements for the next 10 to 40 years are in excess of $1.7 billion. A significant percentage of funding is in place for short term capital improvements. A wide variety of challenges to implementing capital improvements were listed, including:

- Complex state and federal regulations
- Reliable funding stream for construction and maintenance
- Increasing costs
- Planning and management

In addition, many respondents indicate a concern about their ability to serve urban growth boundary expansion areas. The majority of service providers participate in several intergovernmental agreements and see a definite benefit to expanding their cooperation and coordination with other service providers.

Stormwater

The cities of Cornelius, Gladstone, Milwaukie, Oregon City, Portland, Tigard, Troutdale and Wood Village provided information about Stormwater infrastructure. Service providers indicate that their systems have little to no excess capacity. Seven of the service providers identify a total of $32.9 million in planned capital improvements, of which a small portion is fully-funded. Stormwater service providers list the same challenges to implementing capital improvements as sanitary sewer providers:

- Complex state and federal regulations
- Reliable funding stream for construction and maintenance
- Increasing costs
- Planning and management

A lack of political will to raise funds for infrastructure is an additional concern. About half of the respondents indicate that they currently coordinate with other providers and see opportunities for additional coordination.

Transportation

The cities of Cornelius, Gladstone, Happy Valley, Hillsboro Milwaukie, Oregon City, Tigard and Troutdale, and Washington County completed questionnaires in regards to transportation infrastructure. Six of these service providers list planned capital improvements in excess of $420 million with less than 10% of these improvements fully-funded. Again, the biggest challenges to implementing capital improvements are:

- Complex state and federal regulations
- Reliable funding stream for construction and maintenance
- Increasing costs
- Planning and management
- Lack of public dialogue/political will

The majority of these jurisdictions coordinate with their respective county and see opportunities to increase efficiencies and raise funds by partnering with counties, the state and adjacent cities. Several service providers indicate that rising fuel costs are a concern and that the yield on the gas tax will decrease as cars become more fuel-efficient. Opportunities exist to benefit from increased multi-modal services.

Water

Thirteen service providers completed questionnaires related to water infrastructure. Planned capital improvement costs for twelve of these service providers total approximately $850 million for the next five to twenty years. Funding for these capital improvements varies from one provider to the next. Intergovernmental coordination is listed as a major challenge in addition to those identified by providers of other infrastructure types (regulations, funding, costs and planning). Most water providers currently partner with other agencies and are exploring opportunities for additional coordination. Service providers state that while water conservation efforts reduce demand, they also reduce revenue.

Memorandum

To: Malu Wilkinson, Metro; Arnold Cogan and Steve Faust, Cogan Owens Cogan

Date: January 11, 2008

From: Todd Chase, AICP LEED, FCS GROUP

RE: Regional Infrastructure Analysis, Preliminary 30-Year Infrastructure Costs

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Purpose: Describe options for assessing 30-year infrastructure costs

The findings contained in this memorandum are intended to serve as a framework for discussing possible local, community, and regional infrastructure costs within the Portland Metro region associated with projected growth through year 2035. The focus of this work is on local, community and regional infrastructure facilities, such as roads, transit, water, sanitary sewer, storm water facilities and schools.

The basis of our work takes into account preliminary growth forecasts for the tri-county Metro region per the Metroscope model for 2035. We have compiled 30-year growth forecasts for households and employment based on the Metroscope model, which forecast an additional 593,000 new jobs and 312,800 new households by 2035. **Local investment and policy choices would impact where housing and employment locate, but not the regional total.** This information is for analysis purposes only.

Metro staff has provided a preliminary analysis of infrastructure costs using national literature, as summarized in a Memorandum from Ted Reid dated December 6, 2007. We have included a summary of key findings from that Memo in **Table 1**, which shows a total infrastructure cost to serve forecasted growth of $22.9 billion. The national data do not include maintenance or replacement costs.

As a means to help determine if the Metro assumptions stated in Table 1 are in the ballpark of what would be expected in the Metro region, we have evaluated other assumptions contained in Metro's 2035 Regional Transportation Plan (RTP), projects submitted to the Oregon Economic and Community Development Department (OECDD) in the Metro region for a statewide inventory of infrastructure needs for economic development, and local facility plans. The analysis of regional data results in a total of $33.9 billion for capital expenditures to provide new capacity and $8.5 billion for repairs and reconstruction. These preliminary findings, shown in **Table 2**, indicate that the national infrastructure averages assumed by Metro staff are generally lower than what the RTP and local public facility plans would require in terms of total aggregate infrastructure capital costs. It appears that the national averages shown in Table 1 may understate required capital funding for transportation, water, and sewer facilities in the Metro region; and do not include cost estimates for repair and maintenance, which could account for 15% to 30% of total required infrastructure funding needed over the next 30 years.

Table 3 provides preliminary infrastructure demand forecasts for water, sewer, parks, schools, public facilities and power using unit-cost forecasts developed by Otak, Inc. in their Memo dated December 31, 2007. The demand forecast could then be applied to national or regional infrastructure average costs as another method of determining the total cost of providing the infrastructure needed to accommodate the projected growth to 2035.

Next Steps

These preliminary assumptions will be refined based on additional review of local public facility plans, Transportation System Plans, Capital Improvement Plans, case studies, and feedback from the Metro IAC, service providers and other project stakeholders. The demand forecasts and cost assumptions will help determine overall infrastructure cost requirements and potential demand by infrastructure type and location as we proceed with the remainder of this infrastructure study.

Table 1 Preliminary Analysis of Infrastructure Costs Based on National Data

Metro Households*		
Existing 2005	599,604	
Projected 2035	912,434	
Change (30 Yrs)	312,830	
Local Infrastructure Capital Cost**		**Capital Cost ($M)**
Transport		$3,128
Water		$1,721
Sewer		$1,564
Parks		$313
Storm water		$626
Total		$7,352
Community Infrastructure Capital Cost**		**Capital Cost ($M)**
Transport		$2,346
Water		$1,095
Sewer		$938
Parks		$156
Storm water		$313
Public Facilities (civic/government buildings)		$0
Schools		$1,408
Total		$6,257
Regional Infrastructure Capital Cost**		**Capital Cost ($M)**
Transport		$7,664
Water		$0
Sewer		$0
Parks		$0
Storm water		$0
Public Facilities (civic/government buildings)		$1,721
Schools		$0
Total		$9,385
Total Infrastructure Capital Cost**		**Capital Cost ($M)**
Transport		$13,139
Water		$2,815
Sewer		$2,503
Parks		$469
Storm water		$938
Public Facilities (civic/government buildings)		$1,721
Schools		$1,408
Total		**$22,993**

** Compiled by FCS GROUP based on Metroscope forecasts.*
*** Assumptions per Metro Memo dated December 6, 2007.*

Table 2 Preliminary Analysis of Infrastructure Costs Based on Regional Data

		Prelim. Estimated Allocation		
		Repairs & Reconstruction	**New Capacity**	**Total**
RTP Transport Investments		20%	80%	100%
Preferred System ($M)		$3,380	$13,520	$16,900
Constrained System ($M)		**$1,782**	**$7,130**	**$8,912**
Estimated Constrained Transport System Requirements Per RTP by Infrastructure Type				
RTP Constrained System				
Local ($M)	45%	$802	$3,208	$4,010
Community ($M)	25%	$446	$1,782	$2,228
Regional ($M)	30%	$535	$2,139	$2,674
Total	**100%**	**$1,782**	**$7,130**	**$8,912**
Other Transport Investments*	Factors*			
Local ($M)	2.5	$2,005	$8,021	$10,026
Community ($M)	1	$446	$1,782	$2,228
Regional ($M)	0	$0	$0	$0
Total		**$2,451**	**$9,803**	**$12,254**
Total Transport Investments				
Local ($M)		$2,807	$11,229	$14,036
Community ($M)		$891	$3,565	$4,456
Regional ($M)		$535	$2,139	$2,674
Total		**$4,233**	**$16,933**	**$21,166**
Total Infra Investments	Share of Total**			
Transport	40%	$4,233	**$16,933**	$21,166
Water	16%	$1,129	**$4,515**	$5,644
Sewer	17%	$1,199	**$4,798**	$5,997
Parks	2%	$141	**$564**	$706
Storm water	1%	$71	**$282**	$353
Public Facilities	7%	$494	**$1,975**	$2,469
Schools	15%	$1,058	**$4,233**	$5,292
Urban Amenities	2%	$141	**$564**	$706
Total	**100%**	**$8,466**	**$33,866**	**$42,332**

** Estimates based on preliminary review of local long range facility plans. Factors are multiplied by the Constrained RTP transport costs to account for local transport facilities not reflected in the RTP.*
*** Infrastructure cost share allocations take into account local public facility plans, and the projects identified as infrastructure needs in the Metro Region by local governments for OECDD as of Dec. 2007; and preliminary allocations for schools.*

Table 3 Preliminary 30-Year Infrastructure Demand in Metro Region

	Units		Growth Factor*		Demand Forecast	
Water**	115	GPCD	751,000	people	**86,365,000**	Gallons Per Day
Sewer						
Residential	80	GPCD	751,000	people	60,080,000	Gallons Per Day
Employment	75	GPED	593,000	jobs	44,475,000	Gallons Per Day
Other	20%	of total			336,000	Gallons Per Day
Total					**104,891,000**	Gallons Per Day
Parks**	0.015	acres per capita	751,000	people	**11,265**	Acres
Public Facilities	0.61	SF per capita	751,000	people	**458,110**	SF floor area
Schools - Students						
Primary	0.024	Students per capita	751,000	people	**18,024**	students
Middle	0.017	Students per capita	751,000	people	**12,767**	students
High School	0.028	Students per capita	751,000	people	**21,028**	students
Total					**51,819**	
Schools						
Primary	360	Students per school	18,024	students	**50**	schools
Middle	590	Students per school	12,767	students	**22**	schools
High School	1180	Students per school	21,028	students	**18**	schools
Total					**90**	
Power**	13	MWh per capita	751,000	people	**9,763,000**	Mega Watt Hours

** Derived from Metroscope forecasts, compiled by FCS GROUP using unit costs from Otak, Inc.*

*** Demand units are intended to reflect both residential and non-residential demand.*