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RE: FLIP Utility Systems Opportunities and Concepts

Memo

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1. Development Assumptions

EXISTING CONDITIONS (2010)

Based on RLIS data, the 1225-acre Foster Corridor area consists of the following development (by building area):

- Commercial = 2,398,069 SF (24%)
- Residential (single-family and multi-family) = 7,308,998 SF (73%)
- Industrial = 339,894 SF (3%)
- Open Space = 0 SF (0%)
- ROW = 0 SF (0%)
- **Total = 10,046,961 SF (100%)**

FUTURE CONDITIONS (2035)

Development estimates to be determined. As a placeholder, assume 10% growth between 2010 and 2035 which would result in the following development (by building area):

- Commercial = 2,637,876 SF (24%)
- Residential (single-family and multi-family) = 8,039,898 SF (73%)
- Industrial = 373,883 SF (3%)
- Open Space = 0 SF (0%)
- ROW = 0 SF (0%)
- **Total = 11,051,657 SF (100%)**

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ENERGY

1. Energy Demands, Costs and Carbon

EXISTING CONDITIONS (2010)

Foster Corridor is served by PGE for electricity and NW Natural for natural gas. PGE's generation mix is comprised mainly of hydro. Electricity rates average \$0.08 (Commercial), \$0.9 (Residential) and \$0.06 (Industrial). Carbon emissions per kWh generated equals approximately 0.0007 tCO₂. NW Natural rates average \$1.09 (Commercial), \$1.14 (Residential) and \$1.09 (Industrial). Carbon emissions per therm generate equals approximately 0.0067 tCO₂.

NOTE – Rates are volumetric only. All existing and future energy costs were based on current energy rates (ie, no escalation).

Building specific energy demand factors were established for Foster Green based on land use, building area, existing utility data for the district and Portland-specific building demand assumptions. Based on these assumptions, annual district energy demand for 2010 was estimated to be:

- Electricity = 113,045,564 kWh/year
- Natural Gas = 3,519,722 therms/year
- **Total = 737,718 MMBTUs/year**

The distribution of energy demand by land use type was estimated as follows:

- Commercial = 27%
- Residential = 70%
- Industrial = 4%
- Open Space = NA
- **Total = 100%**

Commercial buildings account for 27% of annual energy demand, residential buildings account for 70% and industrial buildings 4%. Energy demand from open space and ROW land use types are negligible (less than 1%). Average commercial EUI is 0.081 (MMBTU/SF) and residential EUI is 0.070 (MMBTU/SF). Approximately 52% of energy demand is supplied by electricity and 48% by natural gas. Total annual energy costs are estimated at \$13.4M/year and carbon emissions at 102,000 tCO₂.

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FUTURE CONDITIONS (2035)

By 2035, building specific energy demand is projected to be:

- Electricity = 124,257,695 kWh/year
- Natural Gas = 3,871,695 therms/year
- **Total = 811,174 MMBTUs/year**

The distribution of energy demand by land use type is the same as in 2010.

2. Energy Goals

ENERGY USE REDUCTION

Foster Green EcoDistrict goals target net-zero energy by 2060. Energy-related in Portland's Climate Action Plan (CAP) include a 25% reduction in existing building energy demand by 2035, net-zero GHG emissions for all new buildings by 2035, and 10% of total energy met through on-site renewables and clean district energy by 2035. Achieving these three CAP goals in the Foster Corridor would require a 37% reduction in energy by 2035.

3. Energy Strategies

Achieving an 85% reduction in energy demand by 2035 will require a comprehensive energy strategy for the Foster Corridor based on the following areas of focus and reduction targets:

- Existing Buildings = 23%
- New Buildings = 5%
- Renewables = 9%
- District Infrastructure = TBD
- Demand Management = TBD
- **Total = 37% Reduction**

EXISTING BUILDINGS

By 2035, existing buildings will consume 91% of total annual energy. Although residential buildings account for a majority of the building area in the Foster Corridor (73%), they only account for 27% of the energy demand. Whereas commercial buildings account for 24% of the building area and 70% of the energy demand.

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Aggressive, yet proven, building retrofit strategies could be utilized to reduce existing building energy demands by 20-40%. Assuming 100% of all existing buildings are retrofitted to reduce energy demand to meet CAP goals, a 25% energy demand reduction would be achieved.

Foster Corridor should pursue two existing building energy reduction pathways – one for residential buildings and one for commercial buildings. Clean Energy Works Oregon should be utilized for the residential buildings and a private energy services provider (ESCO) should be utilized for commercial buildings.

NEW BUILDINGS

9% of energy demand by 2035 will come from new buildings. Should new buildings achieve LEED certification, energy reduction benefits would range from 15-55%. Assuming all new buildings achieve LEED Gold (50% energy reduction), the overall energy reduction benefit would be around 5%.

LEED Gold should be achieved for all new buildings in the Foster Corridor area.

RENEWABLES (SOLAR PV)

Future roof top area will be around 122-acres, given a typical coverage of 40% and an adoption rate of 25%, 1,334,025 SF of roof top would be available for solar PV. This would generate approximately 23,344,400 kW annually, reducing annual energy demand by about 9%.

Foster Corridor should utilize a private solar provider such as Solar City to develop a commercial and residential solar program to simplify delivery of solar PV throughout the corridor.

DISTRICT ENERGY

Not likely due to lack of appropriate demand density.

DEMAND MANAGEMENT

To further minimize energy demands within the district, education supported through emerging technologies should be used within the district to educate and encourage energy reduction actions.

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WATER

All water for Foster Corridor is currently supplied by the City of Portland. Portland's water supply is primarily served by the Bull Run watershed on western foothills of Mt. Hood with secondary water supply by groundwater wells from the Columbia South Shore Well Field. Water rates average \$3.09/CCF.

Sanitary sewer from Foster Corridor is collected and conveyed by both combined sewer and sanitary sewer to the Columbia Boulevard Wastewater Treatment Facility in North Portland. Sanitary sewer rates average \$7.63/CCF (Commercial), \$7.54/CCF (Residential) and \$7.63/CCF (Industrial).

All rates are volumetric only. Additional base service charges also apply but were not included in this analysis. All existing and future water costs were based on current water rates.

1. Water Demands, Sanitary Generation Costs and Carbon

EXISTING CONDITIONS (2010)

Building specific water demand factors were established for Foster Corridor based on land use, building area, existing utility data for the district and Portland-specific building demand assumptions.

Based on these assumptions, annual district water demand and sanitary generation for 2010 was estimated to be:

- Water = 240,245,463 gal/year
- Sanitary = 216,220,917 gal/year

The distribution of water demand by land use type was estimated as follows:

- Commercial = 13%
- Residential = 85%
- Industrial = 2%
- Open Space = 0%
- ROW = 0%
- **Total = 100%**

Commercial buildings account for 13% of annual water demand, residential buildings account for 85% and industrial buildings 2%. Water demand from open space and ROW land use types are negligible (less than 1%). Average commercial WUI is

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13 (gal/SF/year) and residential WUI is 28 (gal/SF/year). Annual water costs are estimated at \$7,413,975/year and sanitary costs \$18,146,186.

FUTURE CONDITIONS (2035)

By 2035, building specific water demand and sanitary generation is projected to be:

- Water = 264,270,009 gal/year
- Sanitary = 237,843,008 gal/year

Distribution by land use type is assumed to be the same as is 2010.

2. Water Goals

WATER USE REDUCTION

Based on existing policies and plans for Foster Corridor, specific water reduction goals do not exist. Foster Green EcoDistrict goals target meeting both human and natural needs through reliable and affordable water management. PWB policies do not identify water reduction targets for the City of Portland. The Foster Green Eco-District Assessment established a no net-increase in potable water consumption. This goal will be tested for FLIP where all new water demand within the Foster Corridor should be met through reclaimed water and water conservation.

Applying this “goal” to 2035 water demands for Foster Corridor would result in a 9% reduction in water demand from baseline 2035 demand estimates.

3. Water Strategies

Achieving a 9% reduction in water demand by 2035 will require a water strategy for Foster Corridor based on the following areas of focus and reduction targets:

- Existing Buildings = 5%
- New Buildings = 4.5%
- District Infrastructure = NA
- Demand Management = NA
- **Total = 9.5% Reduction**

EXISTING BUILDINGS

By 2035, existing buildings will consume 91% of total annual water. Based on simple, yet proven, building retrofit strategies could be utilized to reduce existing building water demands by 10-30%. To meet the existing building water demand reduction goal of 5%, existing building water demand, 25% of existing buildings would need to be retrofitted to reduce water demands by 20%.

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To reduce retrofit costs and drive adoption, Foster Green should engage with a private energy services provider (ESCO) that also provides water efficiency services to create an existing building water retrofit program. This private 3rd party delivery program would reduce retrofitting costs to property owners up to 100% assuming the property owner pays the third party the savings realized through their water conservation investment.

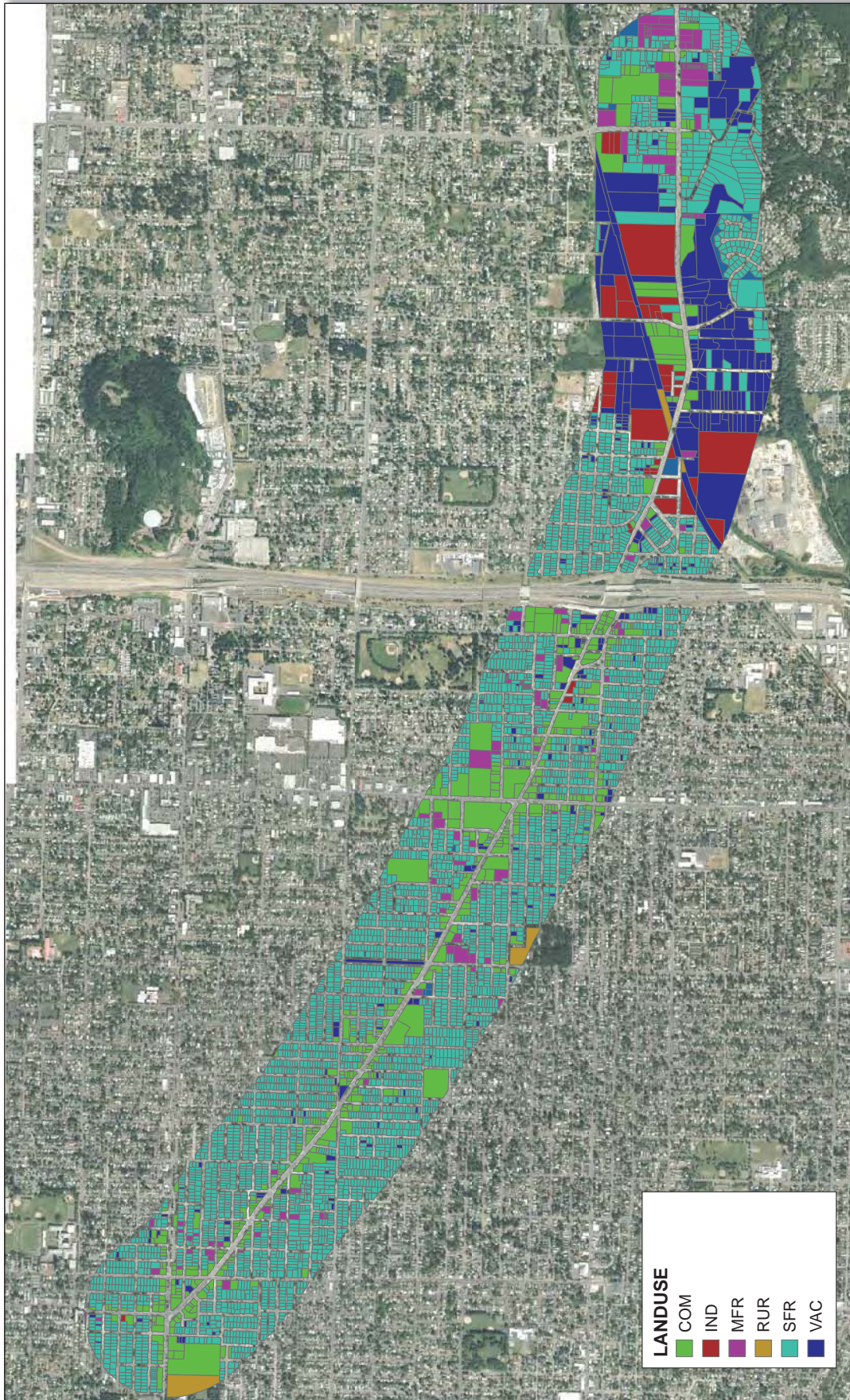
NEW BUILDINGS

9% of water demand by 2035 will come from new buildings. Should new buildings achieve LEED certification, water reduction benefits would range from 20-50%. Assuming all new buildings achieve LEED Gold, the overall water reduction benefit would be around 4.5%.

The current building marketing in Portland assumes no cost premium for LEED Silver and the more innovative developers are finding no cost premium for LEED Gold. As such, the additional cost of all new buildings in the Foster Corridor achieving LEED Gold certification would be \$0.

cc: Kevin Cronin, PDC
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FLIP Study Area



FOSTER CORRIDOR STUDY AREA - LAND USE