



# Solid Waste Forecast FY17-18

Property and Environmental Services  
Solid Waste Information and Analysis  
**October 2016**

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## EXECUTIVE SUMMARY

The state of Oregon and Portland metropolitan region is experiencing above-average economic growth that is increasingly being driven by the consumer. The economic outlook sees a banner year for employment, home prices and construction in 2016 and well into 2017. Nevertheless, the business cycle is maturing, and the outlook beyond 2017 indicates a quick return to more long-run, demographically driven growth rates for all indicators. The outlook for regional waste generation is similar, with strong near-term growth followed by decreasing growth rates beyond 2018.

While the forecast includes some additional residential and commercial food waste diversion in the forecast horizon, the recent declines between 2013 and 2014 in the source-separation rate are expected to continue through 2016, and to not fully recover through the forecast horizon, even with additional food diversion. In addition, post-collection recovery rates are expected to continue to decline through mid-2017, which will put more pressure on the region's recovery rate.

The resulting forecasts for core (wet and dry) delivery, revenue applicable to the Solid Waste Fund (SWF) and regulatory allocation tonnage<sup>1</sup> all see continued growth this year and next, from both calendar year (CY) and fiscal year (FY) perspectives. Table 1 provides a summary by CY and FY for last year (actuals), current year (January – July 2016 actuals plus September – December 2016 forecast) and next year (forecast).

### Table 1: Forecast Summary

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<sup>1</sup> These tonnage concepts, as well as the detailed forecasts for each, are explained in more detail in the Results section of this document.

### Forecast Summary - Tonnage Focus Areas

	Calendar Year			Fiscal Year		
	2015	2016	2017	2015 - 16	2016 - 17	2017 - 18
<b>Core Delivery</b>						
Metro	486,003	510,937	493,208	509,286	498,114	496,291
<i>Diff (tons)</i>	37,562	24,934	(17,730)	37,560	(11,172)	(1,823)
<i>Diff (%)</i>	8.4	5.1	(3.5)	8.0	(2.2)	(0.4)
Private	771,913	858,270	934,391	826,730	899,422	940,727
<i>Diff (tons)</i>	43,607	86,357	76,121	89,165	72,692	41,304
<i>Diff (%)</i>	6.0	11.2	8.9	12.1	8.8	4.6
<b>Total</b>	<b>1,257,917</b>	<b>1,369,208</b>	<b>1,427,598</b>	<b>1,336,016</b>	<b>1,397,536</b>	<b>1,437,017</b>
<i>Diff (tons)</i>	81,170	111,291	58,391	126,725	61,520	39,481
<i>Diff (%)</i>	6.9	8.8	4.3	10.5	4.6	2.8
<b>Revenue SWF</b>	1,179,404	1,291,684	1,342,423	1,264,990	1,314,690	1,350,919
<i>Diff (tons)</i>	85,787	112,279	50,739	141,318	49,699	36,229
<i>Diff (%)</i>	7.8	9.5	3.9	12.6	3.9	2.8
<b>Regulatory Allocatable</b>	687,824	712,195	724,649	708,685	716,662	728,783
<i>Diff (tons)</i>	22,776	24,372	12,454	34,873	7,978	12,120
<i>Diff (%)</i>	3.4	3.5	1.7	5.2	1.1	1.7

Core delivery tonnage increased 6.9% in CY 2015 and is expected to increase 8.8% in CY 2016 and 4.3% in CY 2017, to a total of 1.43 million tons. Due to expanded wet waste tonnage allocations for private facilities in CY 2017 (from an expected 55% in 2016 to an expected 58.5% in 2017), and only modest expectations in allocatable tonnage growth (1.7%), Metro facilities will see declines, while private facilities will see corresponding gains. However in 2018 and beyond, when allocations are expected to stabilize, growth should even out. Revenue tonnage applicable to the SWF should grow by 50 and 30 thousand tons in FY16-17 and FY17-18, respectively, to a total of approximately 1.35 million tons in FY17-18.

## METHODS

### Model Summary

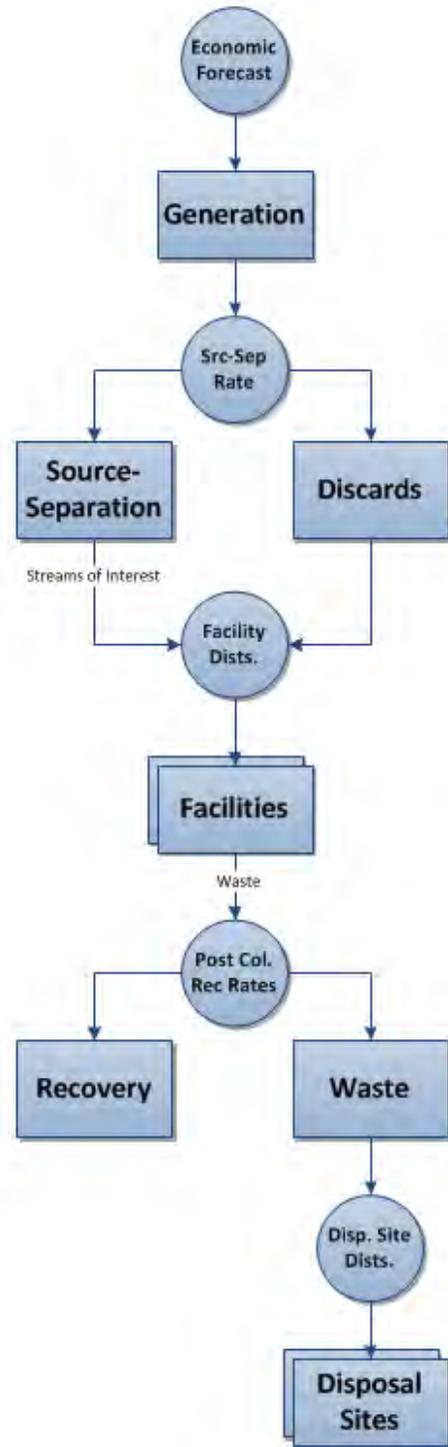
Metro’s solid waste forecasting model is an integrated temporal model of waste generation, source-separation and disposal in the Metro region. The model is used annually to build the solid waste forecast for cost estimation, budgeting, rate-setting and regulatory purposes for the next year. It also produces five additional “planning” years of forecasts. Figure 1 depicts the key steps in the model, which are summarized below.

*Generation:* Waste generation in the region is driven largely by the consumption behaviors of households and businesses. The solid waste forecast starts with a macroeconomic forecast of generation using several economic variables forecasted by the State of Oregon’s Office of Economic Analysis (OEA). The resulting forecast is adjusted based on expert judgment that is solicited during the Review Process described below.

*Source-separation & discards:* After generating waste, households and businesses will source-separate some of their waste for recycling, and discard the remainder as trash. While the degree of source-separation (or, the source-separation rate) is related to a number of factors, one of the largest is the availability of local collection programs and regular pickup for the material streams. The forecast therefore anticipates new or expanded programs that would affect the source-separation rate, and the amount of discards for disposal.

*Facility-specific streams:* The distribution of discards and some source-separated streams of interest (SOI) to various facilities is a vital part of the forecast’s ability to predict which generated tons set rates, incur costs and generate revenue for Metro. As such, the forecast tries to anticipate issues which would affect these distributions and by how much, such as known operational changes at facilities, market changes, and policies that would impact wet waste allocations.

Figure 1: Model



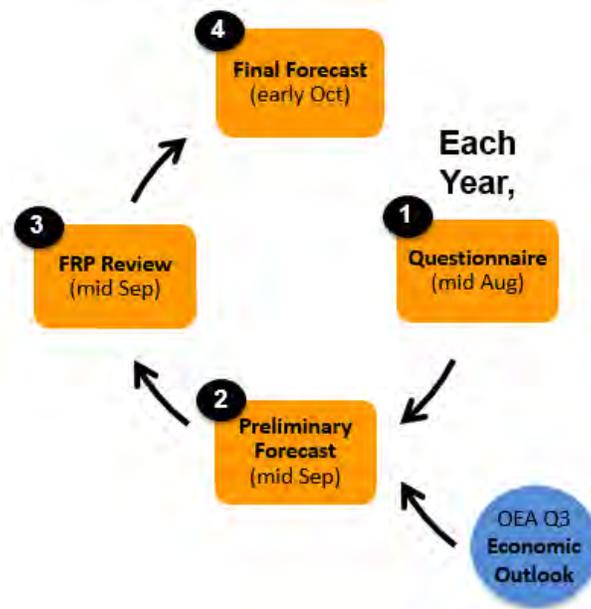
*Post-collection recovery:* Because Metro assesses fees and taxes on disposal, the forecast makes important assumptions about the recovery operations at facilities, such as new technologies, upcoming market disruptions or operational changes that would affect recovery rates, and therefore the amount of waste that would be subject to the Regional System Fee and Metro Excise Tax.

Disposition of waste: Metro’s disposal contract, currently with Waste Management through 2019, includes a declining block price rate for disposal based on tonnage volume directly sent, or caused to be sent under Metro’s regulatory authority, to any disposal site owned by its contractor. Metro’s contract also includes a percentage guarantee of flow to its contractor. In order to estimate Metro’s disposal costs and to monitor Metro’s compliance with its flow guarantee, the forecast includes assumptions of the distribution of waste to disposal sites.

### Review Process

An internal review process is used to set the key assumptions within each of the modeling areas discussed above and to finalize the forecast. Figure 2 illustrates the main stages in the review and finalization of the solid waste forecast. The process is comprised of a detailed assumptions review with internal experts (Step 1), development of a preliminary forecast (Step 2), and a panel review and discussion of the preliminary forecast (Step 3), which is used to finalize the forecast (Step 4).

**Figure 2: Solid Waste Forecast Review Process**



The forecast’s primary assumptions are solicited through a questionnaire from a group of internal experts that include solid waste planners, analysts, economists and regulators. The questionnaire (which is provided in Appendix 1) is distributed and collected in August, and forms the basis for the production of the preliminary forecast in September. A Forecast Review Panel (FRP), consisting of Metro’s economist and solid waste directors, then reviews the preliminary forecast and suggests changes before finalization and distribution in October.

## MAJOR ASSUMPTIONS

### Economic Outlook

#### Overview

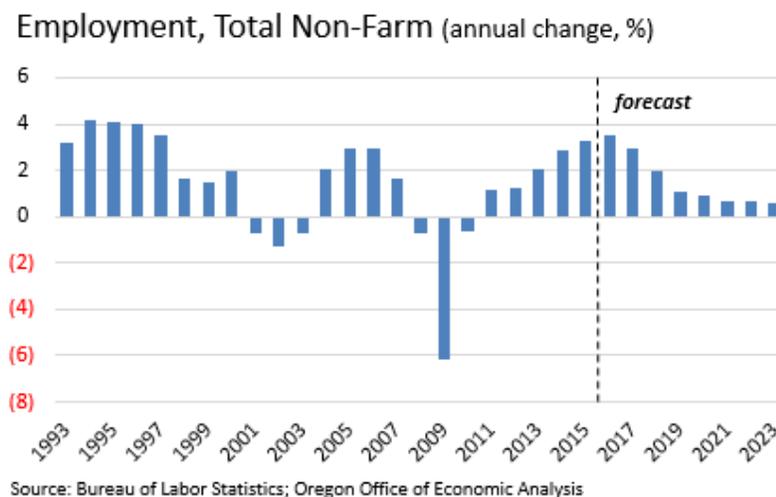
As labor markets continue to improve, businesses compete on price to attract and retain the best workers. Average annual wages increased by about 4% between 2014 and 2015, and continue to increase at rates that are faster than inflation<sup>2</sup>. Further, job growth in the region has been about 3% or more since the start of 2015. Due to continuous job gains and rising wages, the consumer is driving economic growth today, both nationally and locally. These factors and others have been yielding above average economic growth in the Portland metro region and the state as a whole.

Appendix 2 contains OEA's detailed economic forecast that underpins the forecast of solid waste generation in the region. What follows are summary excerpts for the primary drivers of generation.

#### Employment

Employment growth in the state and metro region continues to be full throttle, and the Office of Economic Analysis (OEA) projects that the state economy will reach full employment shortly. Job growth in Oregon registered 3.3% in 2015, and is expected to hit 3.5% in 2016, before longer-run demographics bring growth rates back down. Oregon currently ranks second in the nation in terms of employment growth<sup>3</sup>, and this relative growth advantage will ensure an influx of new households from other states<sup>4</sup>.

Figure 3: OEA Employment Growth Forecast



<sup>2</sup> Office of Economic Analysis (OEA), Oregon Economic and Revenue Forecast. June 2016, 16.

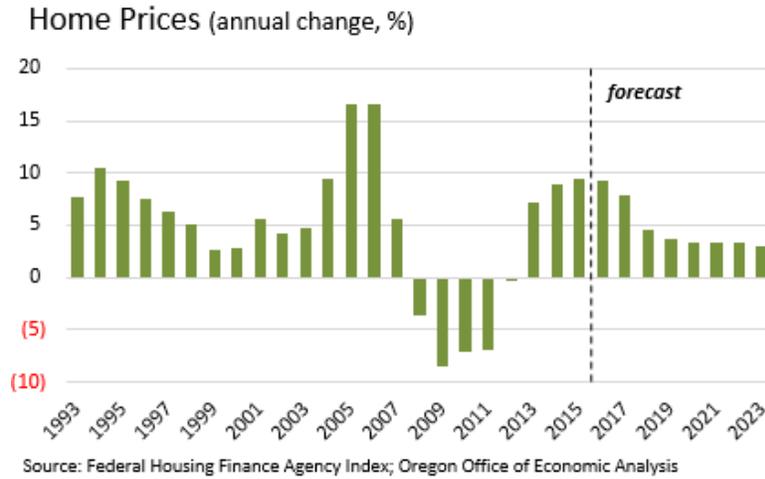
<sup>3</sup> Arizona State University Carey School of Business June 2016 State Rankings

<sup>4</sup> OEA, 7

## Home Prices

As the economy continues to improve and new households form, demand for housing will continue to increase, which will continue to bid up home prices. Prices have been growing at strong and steady rates of about 10%, and OEA expects this growth to continue through 2017, when price pressure starts to ease.

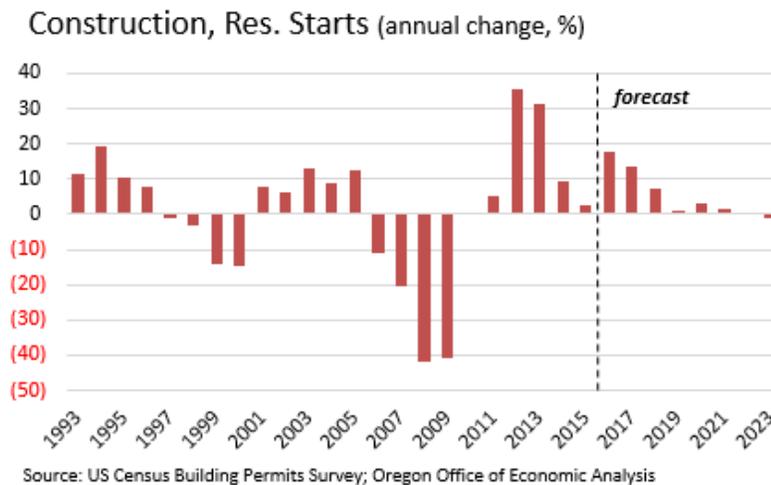
**Figure 4: OEA Home Price Growth Forecast**



## Construction

Construction activity in new home starts leaped out of the Great Recession at 30% growth or better, but recently has pulled back. OEA estimates that this underbuilding is partially responsible for the recent increases in home prices, and that home construction is about a year behind stable growth levels. Nevertheless, construction jobs have been growing at about a 5% clip this year, and expectations are that new construction will pick up in the next few years to match the increase in housing demand, which will help alleviate price pressure.

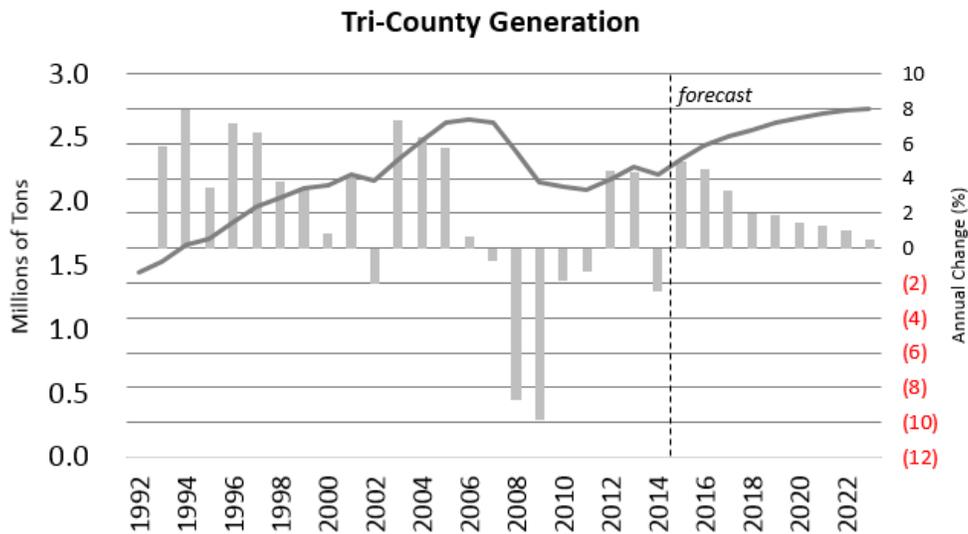
**Figure 5: OEA Home Start Growth Forecast**



## Generation

Metro’s econometric model of generation, as well as the independent qualitative judgement of all technical reviewers, anticipates continued growth in waste generation. After an unexpected decline of tons in 2014 (56,000, 2.5%), which is the last year of actuals, generation should rebound quickly in 2015 (5% growth) and 2016 (4.5% growth), growing at rates similar to those seen in 2012 and 2013 during the climb out of the last recession, but not as fast as those seen coming out of the 2000/2001 recession. Growth rates are expected to slow considerably from there, as Baby Boomers retire and labor force participation growth slows. Generation should reach pre-recession levels of 2.6 million tons by 2019/2020, and then grow with general population trends thereafter.

**Figure 6: Generation Growth Forecast**



## Risk & Uncertainty

While the consensus outlook, both locally and nationally, does not anticipate an upcoming recession, the current business cycle is maturing, and the next contraction may be around the corner. IHS Global Insight puts the probability of a recession sometime in the next year at 20%<sup>5</sup>.

## Source-Separation

The forecast anticipates a pickup in regional residential curbside food collection programs in various jurisdictions throughout the region. The cities of Forest Grove and Lake Oswego have recently implemented programs that allow residences to place food waste in their yard debris, and several more are expected in the near future. The table below lists each program, its anticipated start date, and the anticipated annual tons of mixed food and yard debris that would affect source-

<sup>5</sup> IHS Economics, US Executive Summary, August 2016 p1 (IHS.com)

separation. Metro assumes that the food waste only portion of this mix is 6.5% of the total for each program<sup>6</sup>.

**Table 2: Recent or Anticipated Residential Curbside Food Collection Programs**

<b>Program</b>	<b>Start</b>	<b>Expected Annual Tons</b>
City of Lake Oswego (recently implemented)	June 2016	5,400
City of Forest Grove (recently implemented)	July 2016	2,500
City of West Linn (anticipated)	July 2017	3,200
City of Gresham (anticipated)	July 2017	13,000
Unincorporated Washington County (anticipated)	July 2017	28,000

In addition to residential food waste diversion, the forecast incorporates the phase in of Portland’s mandatory commercial food waste management program.<sup>7</sup> This program is slated to begin in April 2018 in phases. Specifically, Phases 1 through 4, starting each spring beginning in 2018 through 2021, are expected to capture a total of 22,500 additional tons of food waste per year, by the end of Phase 4.

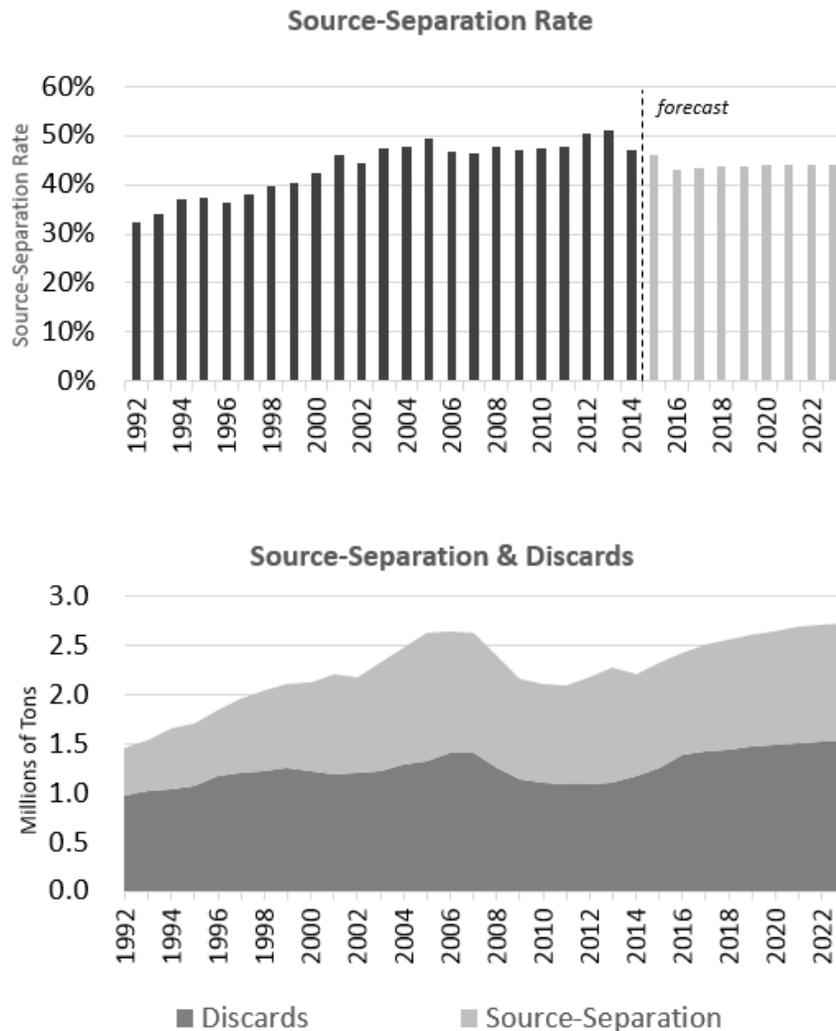
These expectations will affect the tonnage of source-separation and discards starting in 2017, when it is expected that the source-separation rate will stabilize and then grow slightly, with increased regional residential and commercial food waste capture. Leading up to this point, however, the source-separation rate should decline by a point in 2015 to 46% (after declining 4 points from 2013 to 2014) and by another few points in 2016 to about 43%, on account of the recent wood market issues.

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<sup>6</sup> Cascadia Consulting and Metro, Organics Stream Composition Study, 2012

<sup>7</sup> City of Portland, Mandatory Commercial Food Scraps Management: Proposal for Implementation, 2016

**Figure 7: Expected Source-Separation Rate Growth and Resulting Discards**



**Risk and Uncertainty**

On the downside, the lack of viable, large-scale wood recovery markets, especially for urban wood waste, may intensify upstream signals to households and businesses to source-separate less of their wood, even on relatively clean streams of wood. This has the potential to further erode source-separation rates in 2017 and beyond, despite the anticipated gains made by food waste capture.

But there is upside risk too. Increased mattress diversion and potential new markets for plastics recovery, including polystyrene foam, are developing and could increase source-separation rates in the medium to long term. In addition, the cities of Beaverton and Hillsboro, which are currently exploring curbside residential food waste programs, could end up implementing programs in the forecast horizon. These programs could capture and divert a couple thousand additional tons of food from households’ trash bins, and increase the source-separation rate by a small amount.

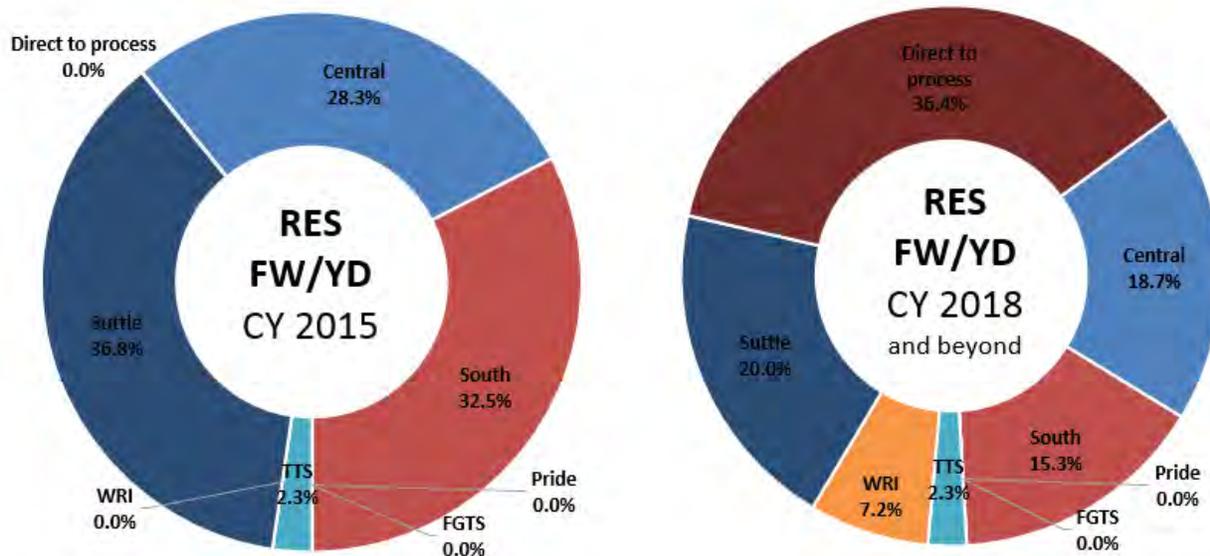
## Facility Distributions

For the distribution of key waste streams to facilities, the forecast assumes that the status quo (represented by current market or distributional shares) will largely persist, with two primary exceptions: 1.) the distribution of source-separated residential food waste mixed with yard debris, and 2.) the allocation of putrescible discards.

### Source-Separated Residential Food/Yard debris

The forecast assumes that the distribution of residential food waste mixed with yard debris directly to processing sites will increase through 2018 with the implementation of the new residential curbside programs discussed above. Specifically, the tonnages from Forest Grove, Gresham and unincorporated Washington County are all expected to be hauled directly to processors in North Plains, Aumsville or Adair Village. For the cities of Lake Oswego and West Linn, the forecast expects that Republic and Kahut, respectively, will deliver the waste to WRI in Wilsonville, and the distributional shares to that facility will increase accordingly. To compensate, distributions to Recology's Suttle Road facility and to Metro Central and Metro South transfer stations will all decrease.

**Figure 8: Residential Food Waste/Yard Debris Facility Distributions, 2015 vs. 2018**



### Putrescible Discards

For putrescible waste, the forecast assumes that all private entities will meet their 2016 tonnage limits established by Metro, and that Metro will allocate tons to private transfer stations in 2017 and beyond based on the policy adopted by Metro Council through Resolution 16-4716. While the implementation details have not yet been worked out, the forecast assumes that the 2017 allocations for Pride, Troutdale and WRI transfer stations will be based on the proportion of those facilities' 2015 franchise tonnage caps to the total amount of in-district, putrescible waste

("allocatable waste") in that year, which was 10.69% for each station. For all other entities, the forecast assumes that fixed tonnage amounts, either previously committed or anticipated will be allocated in 2017.

**Table 3: Expected Putrescible Tonnage Allocations to Private Entities**

Based on Percentage	CY 2015		CY 2017			CY 2018 - CY 2023
	Percentage		Allocatable	Allocation	Resulting %	
Pride	10.69 %	X	724,649	= 77,435	10.69 %	●→→→
TTS	10.69 %	X	724,649	= 77,435	10.69 %	●→→→
WRI	10.69 %	X	724,649	= 77,435	10.69 %	●→→→
<b>Based on Tonnage</b>						
FGTS	---	--	---	125,000		●→→→
New TS/Gresham	---	--	---	23,000	3.17 %	●→→→
New TS/CORE	---	--	---	1,000	.14 %	●→→→
Direct to Vancouver	---	--	---	30,119	4.16 %	●→→→
Direct to Canby	---	--	---	16,600	2.29 %	●→→→
Direct to Covanta	---	--	---	1,680	.23 %	●→→→
Direct to Landfill	---	--	---	180	.03 %	●→→→

For the purposes of this forecast, allocations for CY 2018 through 2023 are assumed to follow the 2017 percentage shares for each entity<sup>8</sup> and the allocatable tons in each year. Metro intends to establish a new allocations procedure in the next year that considers factors such as need, proximity, and new entrants when making allocations for CY 2018 and beyond, and this is expected to change the facility allocations.

**Risk & Uncertainty**

There is a great deal of uncertainty regarding the distribution of waste to facilities in the forecast horizon, even in the short term. What follows is a discussion of this uncertainty, for each of the four waste streams.

*Residential food waste/yard debris:* If the cities of Beaverton and Hillsboro implement curbside collection programs for this material, there should be even larger distributions of waste directly to processors than what is currently anticipated. This will further erode tonnage from other facilities, including Metro’s transfer stations.

*Commercial food waste:* Metro Council will consider taking a direct flow control approach to collecting and processing commercial food waste in the region. This approach could direct all waste to Metro Central and Metro South transfer stations, starting in 2018. Until renovations are complete at Metro South, other private facilities would need to take the existing residential food waste and yard debris at South, causing uncertain feedbacks on distributional shares between streams and facilities.

<sup>8</sup> with the exception of Forest Grove Transfer Station, which assumes a fixed tonnage allocation of 125,000 annual tons.

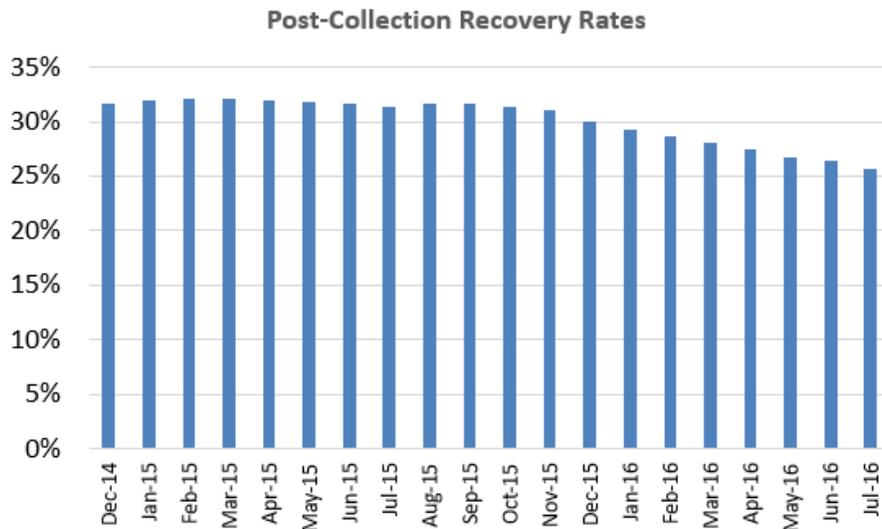
*Mixed dry waste:* Metro’s suspension of the Enhanced Dry Waste Recovery Program (EDWRP) and DEQ’s zero tolerance policy toward delivery of asbestos loads to MRFs and transfer stations could increase the distributions of waste direct to landfill and potentially increase illegal disposal of these materials in dumps or unauthorized out-of-region facilities. These shifts will directly reduce core delivery tonnage at Metro transfer stations, but will not affect the tonnage subject to Metro’s Regional System Fee (RSF) or Excise Tax (ET).

*Putrescible waste:* Metro’s share of allocatable tonnage is expected to decline between its actual 2015 share (46.8%), and its expected 2016 and 2017 shares (44.9 and 40.7%) due to increased allocations to private entities, and only a slightly increasing allocation base. However, it is likely that many of the private entities will not fully utilize their allocations, and that these tons will flow back to Metro transfer stations. These shifts would increase core delivery tonnage at Metro transfer stations.

### Post-Collection Diversion

The single largest user of recovered wood in the Metro region, SP Newsprint, closed and ceased operations at the end of last year, severely disrupting the local wood market. This disruption, coupled with Metro’s suspension of EDWRP, have been associated with rapidly declining post-collection recovery and diversion rates at mixed waste processing facilities in the region. Across all facilities, average recovery rates were around 31% before the S&P Mill closure, and now hover between 25 and 26%.

**Figure 9: Average Annual Post-Collection Recovery Rates**



The severity of these declines is more pronounced for some facilities than others, and a few facilities have seen recent stabilization in their rates. The forecast assumes that while most of the wood market and asbestos-induced declines have occurred, further declines are to be expected through the remainder of 2016, and at least part of 2017 before rates stabilize across facilities.

## **Risk & Uncertainty**

Despite the expected stabilization of post-collection recovery rates in 2017 and beyond, there are a number of downside risks that could cause further reductions. Cheap oil lowers prices for most commodities including recyclables. In addition, temporary or permanent closures of local, easy-access markets (such as paper mills and hogged fuel boilers) could cause further erosion in post-collection recovery.

On the upside, with more food waste source-separation programs expected to remove food from the putrescible waste stream, some facilities may invest in “advanced” material recovery on this stream, which would drive post-collection recovery rates up.

Post-collection recovery rates are sensitive parameters in the forecast, and their fluctuations at private facilities cause increased or decreased disposal of residual that is tonnage subject to Metro’s RSF and ET.

## **Waste Disposition**

With uncertainty about who Metro’s post-2019 disposal contractor(s) will be, and whether Riverbend will remain a disposal option for metro area waste<sup>9</sup>, the forecast largely assumes status quo with a few exceptions.

First, the publicly-owned Cowlitz County Landfill (about 55 miles from downtown Portland) will become an increasingly viable disposal alternative for waste, particularly residual from mixed dry waste processing facilities. The forecast assumes that the distribution of MRF residual from these facilities will increase to Cowlitz in the forecast horizon.

Second, in 2020, Metro’s 90% flow guarantee of regional tonnage to its disposal contractor (Waste Management) expires. Hence, Metro’s next disposal contract(s) are anticipated to include only the solid waste from Metro’s own transfer stations, and not that from private facilities. The forecast assumes that private transfer stations and MRFs will determine their most cost-effective disposal option. For example, the forecast assumes that WRI will cease deliveries of putrescible waste to Riverbend Landfill effective January 1, 2020, and will instead deliver all but a small fraction<sup>10</sup> of its putrescible waste to Coffin Butte Landfill.<sup>11</sup>

Third, up until the expiration of Metro’s disposal contract with Waste Management, the forecast assumes that Metro will continue to enforce the 90% flow guarantee. If Gresham Sanitary and/or CORE Recycling obtain transfer station franchises in 2016 with tonnage allocations in 2017 and beyond, the forecast expects that these facilities will send sufficient portions of waste to Waste Management-owned landfills for Metro to meet its contractual obligations, plus a 0.5 % management allowance, until the end of 2019. For any remaining waste, these facilities are

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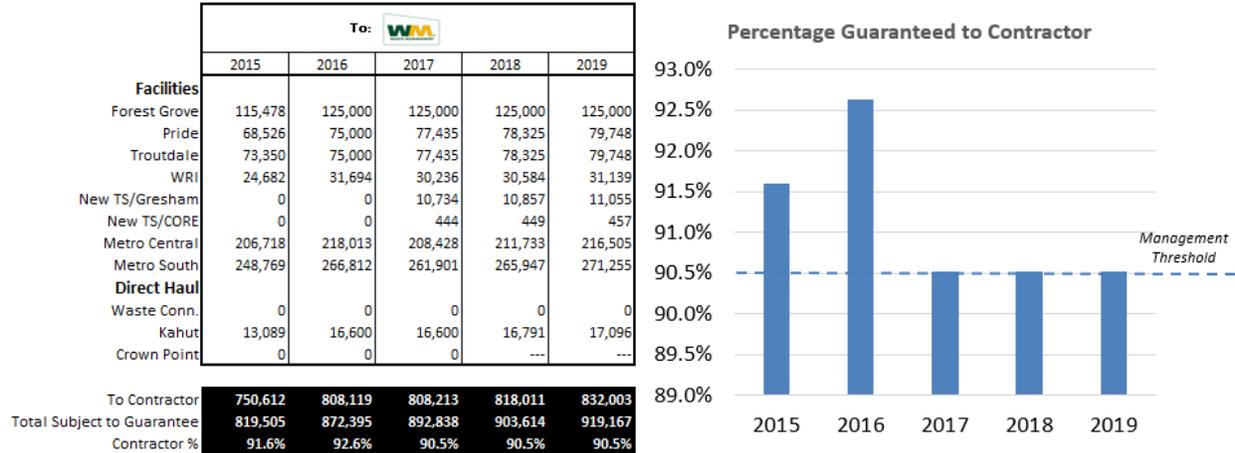
<sup>9</sup> The future availability of Riverbend Landfill in Yamhill County is uncertain until its potential expansion is resolved. If Riverbend ceases to be an option for metro area waste, other disposal options may move to the forefront.

<sup>10</sup> Some of WRI’s waste is sent to Covanta in Marion County.

<sup>11</sup> This paragraph was edited for clarity on October 31, 2016.

expected to use Wasco County Landfill. However, in 2020 and beyond, the forecast assumes that both facilities will exclusively send waste to Wasco County. Figure 10 below illustrates the implications of the forecast on Metro’s flow guarantee.

**Figure 10: Flow Guarantee Implications of Forecast**



### Risk & Uncertainty

Without reasonable certainty (or even consensus expectations among reviewers) of Metro’s future disposal contractor(s), the disposition parameters of the forecast are uncertain. Even before 2019, there is uncertainty as to whether Riverbend Landfill will be a disposal option for metro area waste. These issues would affect disposal site distributions.

## RESULTS

### Focus Areas

The primary results of the solid waste forecast are presented within three tonnage focus areas, as follows:

1. *Core delivery tons* are tri-county-generated putrescible and mixed-dry discards, after source-separation, which are delivered to solid waste facilities. Deliveries are reported for public facilities (i.e. Metro Central and Metro South), private facilities, and in total.
2. *Revenue tons applicable to the Solid Waste Fund (SWF)* are those tons that incur the full Metro RSF and ET. As such, they are generally core delivery tons that are ultimately disposed after transfer or post-collection recovery processing has been performed, and include some industrial process wastes.
3. *Allocatable tons* are in-district-generated, putrescible delivery tons (they are a portion of core delivery tonnage) that form the regulatory allocation base for granting tonnage allocations to private facilities.

In addition to the forecasts themselves, the results sections for each focus area document recent trends, performance statistics between actuals and the previous forecast, and discuss the primary differences between the current and last forecasts. Table 4 below summarizes this information.

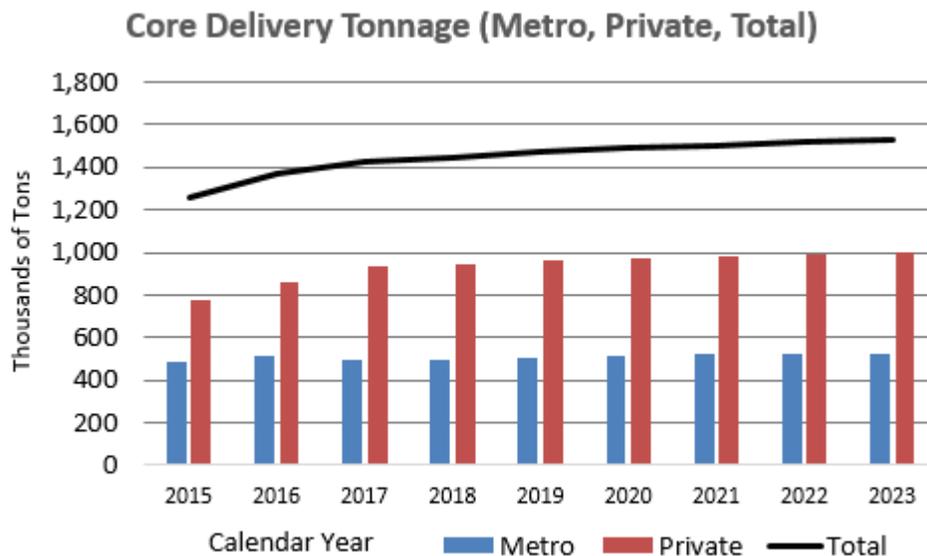
**Table 4: Tonnage Focus Area Trends and Performance Statistics, December – July**

	Tonnage Focus Areas				
	Core Delivery			Revenue	Regulatory
	Metro	Private	Total	SWF	Allocatable
<b>Trends</b>					
Dec 2014 - Jul 2015 ( <i>actual</i> )	318,846	494,260	813,106	755,538	454,708
Dec 2015 - Jul 2016 ( <i>actual</i> )	345,270	564,682	909,952	866,009	478,183
<i>Diff (tons)</i>	26,424	70,422	96,846	110,471	23,475
<i>Diff (%)</i>	8.3	14.2	11.9	14.6	5.2
<b>Performance</b>					
Dec 2015 - Jul 2016 ( <i>actual</i> )	345,270	564,682	909,952	866,009	478,183
Dec 2015 - Jul 2016 ( <i>last fc</i> )	326,789	536,808	863,597	832,383	463,109
<i>Diff (tons)</i>	18,481	27,874	46,355	33,626	15,074
<i>Diff (%)</i>	5.7	5.2	5.4	4.0	3.3
<b>Forecast</b>					
Dec 2015 - Jul 2016 ( <i>actual</i> )	345,270	564,682	909,952	866,009	478,183
Dec 2016 - Jul 2017 ( <i>new fc</i> )	326,902	620,304	947,206	893,721	484,117
<i>Diff (tons)</i>	(18,368)	55,622	37,254	27,712	5,934
<i>Diff (%)</i>	(5.3)	9.9	4.1	3.2	1.2
<b>Changes</b>					
Dec 2016 - Jul 2017 ( <i>new fc</i> )	326,902	620,304	947,206	893,721	484,117
Dec 2016 - Jul 2017 ( <i>last fc</i> )	346,935	552,030	898,965	868,660	479,715
<i>Diff (tons)</i>	(20,033)	68,274	48,241	25,061	4,402
<i>Diff (%)</i>	(5.8)	12.4	5.4	2.9	0.9

## Delivery Tonnage

Core delivery tonnage has been growing at increasing annual rates since the end of the last recession. For the period December through July, core deliveries are almost 12% higher this year than they were last year. This growth has been a little higher for private entities (14%) than Metro facilities (8%). Further, total core tonnage is exceeding the expectations of last year's forecast by about 5.5%. Most of this over-performance is due to an overestimate of the regional source-separation rate in the last forecast, which has likely been negatively affected by the declining local wood market.

**Figure 11: Core Delivery Tonnage (Public, Private, Total) Forecast**



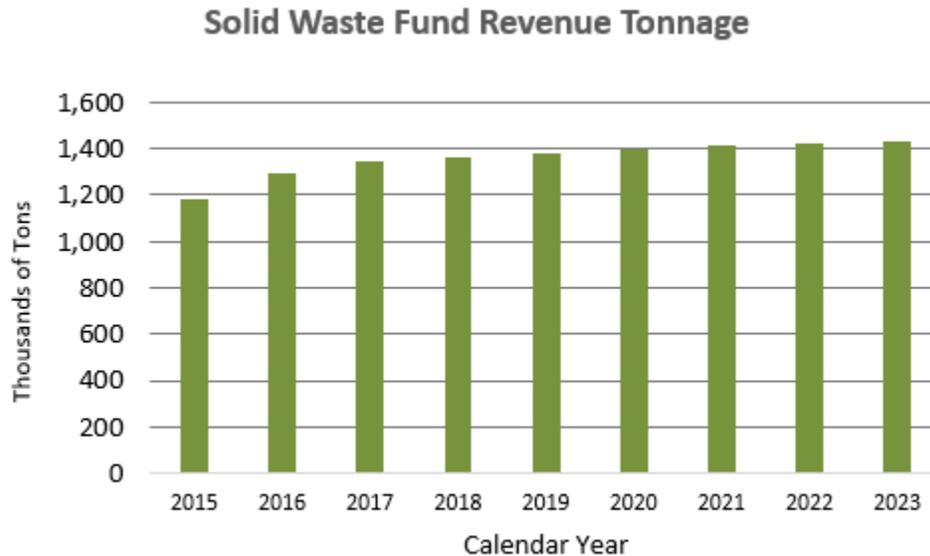
The growth in core tonnage is expected to continue through 2016 and into 2017, when generation is expected to stabilize, and the source-separation rate picks up a tiny bit of steam on the backs of additional food waste diversion. Core delivery tonnage should grow to 1.37 million tons in 2016 (about 9%), and 1.43 million in 2017 (a little over 4%), before falling back to more modest rates of growth thereafter, between 1 and 2%. Metro core deliveries in 2017 will retreat a bit due to expanded allocations of wet waste to private facilities. Assuming these facilities use their full allocations, Metro facilities should see declines of about 23,000 tons (4.5%) between 2016 and 2017, but growth should resume thereafter.

This year's forecast is about 5.5% higher than last year's forecast for total core delivery tonnage, and about 5% lower for Metro deliveries in particular, for the December 2016 to July 2017 period. These differences are primarily due to a lower expected source-separation rate, and the new private tonnage allocation scheme that will take effect in 2017, respectively.

## Revenue Tonnage

Revenue tonnage subject to the SWF has also been growing. Tonnage increased by almost 8% between 2014 and 2015, to 1.18 million tons. The last eight month period alone, between December 2015 and July 2016, has seen year-over-year increases of 14.5%. Similar to the previous forecast of core delivery tonnage, actual revenue tonnage is exceeding our prior expectations by about 4%.

Figure 12: Revenue Tonnage Forecast



The outlook for revenue tonnage is positive, but similar to delivery, sees moderating growth by about mid-2017. However, because of the near-term decline in recovery rates expected at many facilities due to wood markets, revenue tons should grow rapidly in 2016, to about 1.29 million tons (9.5%), and then again to about 1.34 million tons (4%) in 2017.

For the period December 2016 through July 2017, this revenue tonnage forecast is about 3% higher than last year's forecast, primarily due to lower expectations on facility post-collection recovery rates, and a slightly higher projection of industrial process wastes, including asbestos-contaminated loads, that will go directly to landfill.

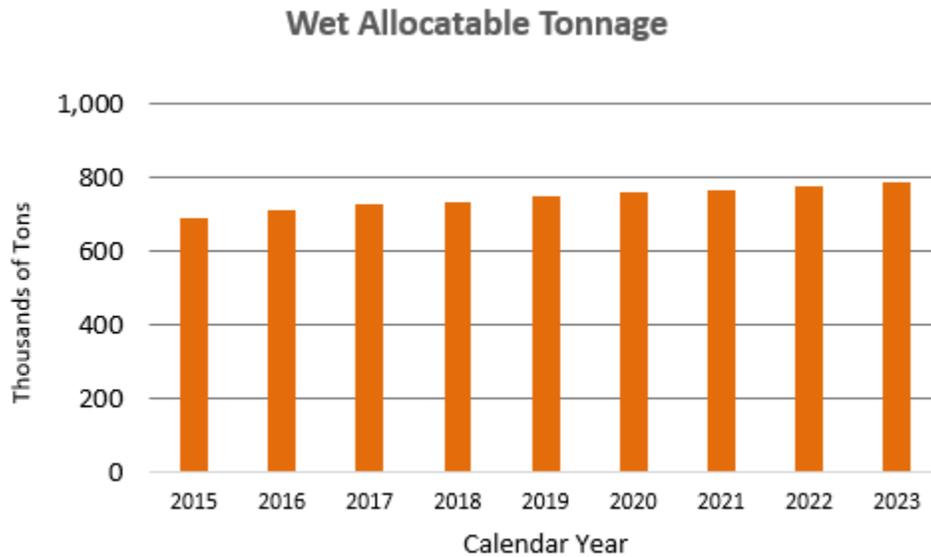
## Allocation Tonnage

In-district putrescible tonnage, subject to Metro's allocation scheme, has also been increasing. Tonnage grew 3.8% in 2014, and 3.4% in 2015, to about 688,000 tons. For the period December through July, allocatable tons are about 5% higher this year than they were last year. And like all other series, actual tons are over-performing last year's forecast by about 3%.

The forecast sees increasing growth in allocatable tons, but not at rates seen over the past couple years. In 2016, tons should grow by 3.5% to about 712,000 tons, which is similar to previous years growth, however, should fall back to long-run growth patterns of between 1 and 2%. In 2017, 2018

and 2019, the forecast sees allocatable tons reach 725,000, 733,000 and 746,000 thousand tons, respectively.

**Figure 13: Allocatable Tonnage Forecast**



For the period December 2016 through July 2017, there is very little difference between this forecast of allocatable tons, and that made last year.

Table 5 below summarizes the allocations of waste to private entities over the last couple years, and Metro’s expectations for 2017, based on the forecast of allocatable tons and the methodology described in the Assumptions section above.

**Table 5: Wet Waste Allocations to Private Entities**

	Tonnage			Percentage Shares		
	2015*	2016	2017	2015	2016	2017
<b>Total Allocatable</b>	<b>687,824</b>	<b>715,456</b>	<b>724,649</b>	<b>100</b>	<b>100</b>	<b>100</b>
Forest Grove TS	114,710	125,000	125,000	16.7%	17.5%	17.2%
Pride Recycling	68,656	75,000	77,435	10.0%	10.5%	10.7%
Troutdale TS	73,337	75,000	77,435	10.7%	10.5%	10.7%
WRI	70,985	75,000	77,435	10.3%	10.5%	10.7%
Gresham (New TS)	0	0	23,000	0.0%	0.0%	3.2%
CORE (New TS)	0	0	1,000	0.0%	0.0%	0.1%
Direct to Vancouver TS	24,261	26,470	30,119	3.5%	3.7%	4.2%
Direct to Canby TS	13,089	16,600	16,600	1.9%	2.3%	2.3%
Direct to Covanta	517	925	1,680	0.1%	0.1%	0.2%
Direct to landfill	180	180	180	0.0%	0.0%	0.0%
<b>Subtotal Private</b>	<b>365,736</b>	<b>394,175</b>	<b>429,885</b>	<b>53.2%</b>	<b>55.1%</b>	<b>59.3%</b>
<b>Subtotal Public</b>	<b>322,088</b>	<b>321,281</b>	<b>294,765</b>	<b>46.8%</b>	<b>44.9%</b>	<b>40.7%</b>

\*Data for CY 2015 are actual tons, not allocations.

### Other Series

The solid waste forecast produces a number of data series other than those described above. For more detailed forecasts of all key tonnage aggregates by calendar year and fiscal year, as well as forecast performance and change statistics, please see Appendix 3.

## **Appendix 1**

# **FY 2017 -18 Solid Waste Forecast**

Forecast Assumptions Questionnaire

CY 2017 through CY 2023

Reviewer: \_\_\_\_\_

Date:

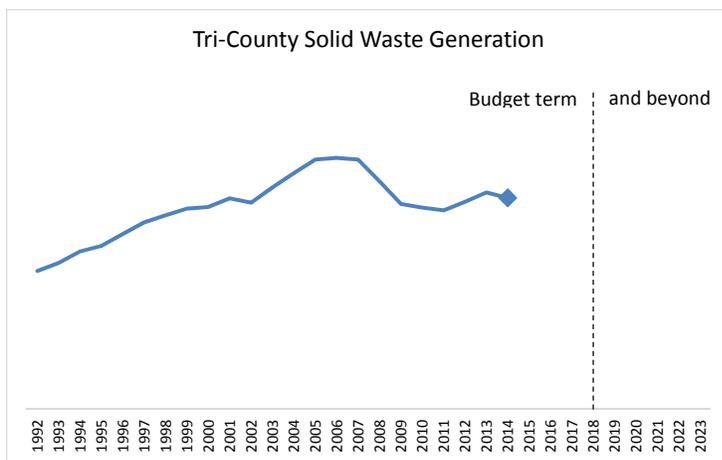
Note to Reviewer: **Please complete and return to Joel Sherman by COB August 19, 2016**

## Generation

Total waste generation in the region is driven largely by economic circumstances. The solid waste forecast starts with a macroeconomic forecast of generation using several economic variables forecasted by the State Office of Economic Analysis (OEA). The resulting forecast is adjusted based on expert judgement.

**Please provide your judgement on the direction of solid waste tonnage generation from now through 2023 by considering either Option 1 or Option 2 below:**

*Option 1: Complete the time plot of tri-county generation (tons, by calendar year) from the diamond (last year of actuals) out to the end of 2023, or at a minimum, 2018. You do not need to draw inflections, but you can if you want.*



*Option 2: Select a qualitative growth scenario for tri-county generation from calendar year 2014 through 2023 by circling one of the following 7 boxes below:*

		Direction		
		Decline	Flat	Growth
Speed	Slow			
	Steady			
	Fast			

## Source-Separation & Discards

After generating waste, households and businesses, including construction contractors, will source-separate some of their waste for recycling, and discard the remainder as trash. While the degree of source-separation among households and firms is related to a number of factors, one of the largest is the availability of programs and regular pickup for the material streams.

Please provide as much knowledge as you can, **about new or expanding programs** for each of the streams of interest (SOI) below, by **completing the following tables for each SOI**.

SOI #1: Residential food scraps mixed with yard debris		
Program	Start (M, Y)	Approx. Annual Tons
Existing: City of Portland	Nov. 2011	84,000/year
New/Expanded: _____	_____	_____
Comments:		

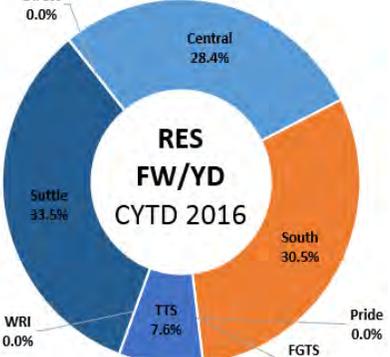
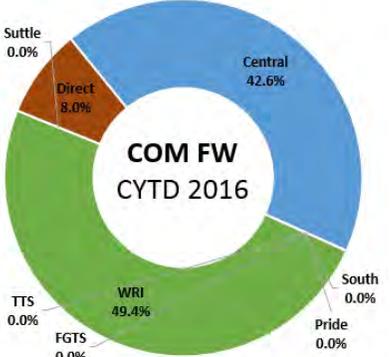
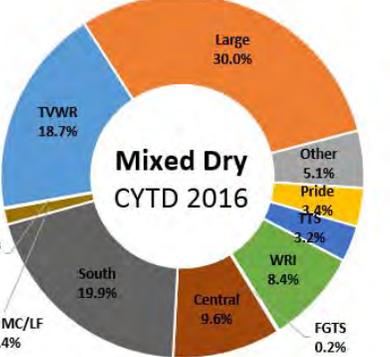
SOI #2: Commercial food scraps		
Program	Start (M, Y)	Approx. Annual Tons
Existing: Regional (various biz)	Jan. 2007	28,000/year
New/Expanded: _____	_____	_____
Comments:		

Other Streams			
Stream/Program	Start (M, Y)	Divert from... (wet or dry)	Approx. Annual Tons
Stream/Program: _____	_____	_____	_____
Stream/Program: _____	_____	_____	_____
Stream/Program: _____	_____	_____	_____
Stream/Program: _____	_____	_____	_____

## Facility Distributions

The distribution of wet and dry discards (and source-separated SOI) to various facilities is a vital part of the forecast’s ability to determine which generated tons set rates, incur costs and generate revenue for Metro.

**For each non-wet stream, please describe any known market or operational changes from now until 2023 that might affect the most recent shares observed at facilities, and by how much. This may include new facility or non-system licensees, new mergers/acquisitions of existing haulers or facilities, or any events that may significantly modify facility operations.**

Recent Market Shares	Issues affecting shares, how much & where...																								
 <p><b>RES FW/YD CYTD 2016</b></p> <table border="1"> <tr><th>Facility</th><th>Share (%)</th></tr> <tr><td>Suttle</td><td>33.5%</td></tr> <tr><td>Central</td><td>28.4%</td></tr> <tr><td>South</td><td>30.5%</td></tr> <tr><td>TTS</td><td>7.6%</td></tr> <tr><td>Direct</td><td>0.0%</td></tr> <tr><td>WRI</td><td>0.0%</td></tr> <tr><td>FGTS</td><td>0.0%</td></tr> <tr><td>Pride</td><td>0.0%</td></tr> </table>	Facility	Share (%)	Suttle	33.5%	Central	28.4%	South	30.5%	TTS	7.6%	Direct	0.0%	WRI	0.0%	FGTS	0.0%	Pride	0.0%							
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“Large” = ECR, Greenway, Suttle; “Other” = Aloha, CORE, KB, NW Shingle, Foster; “OD → LF” = Out-of-district direct to landfill; “ID to MC/LF” = In-district direct to landfill or burner.

For the wet discard stream, the forecast assumes that Metro will allocate tons to private facilities in 2017 and beyond based on the policy adopted by Metro Council through Resolution 16-4716, which uses a percentage allocation methodology. Specifically, Metro allocates wet discards to private facilities using their “base year” CY 2015 distribution, with the remainder (and at least 40% of the total wet discards) reserved for Metro transfer stations. As the table below shows, Metro will start the allocation process in 2017 with 2.74 percentage points ABOVE its 40 percentage point floor.

**In the table below, please indicate how many, if any, of THESE additional points will be awarded to each licensee and when, taking those additional points away from Metro or from private facilities as appropriate. All annual totals of additional points must equal zero (0).**

Private Allocations	Base Year: CY 2015		Give (or take away) Percentage Points!						
	Tons	%	2017	2018	2019	2020	2021	2022	2023
FGTS	125,000	18.17							
Pride	73,500	10.69							
TTS	73,500	10.69							
WRI	73,500	10.69							
Arrow (direct)	30,674	4.46							
Kahut (direct)	16,600	2.41							
Burner (direct) <sup>1</sup>	1,105	.16							
New: Gresham	---	0							
New: COR	---	0							
New: _____	---	0							
New: _____	---	0							
<b>Metro Share</b>		42.74							
<b>Regional Wet</b>	<b>687,824</b>	<b>100</b>	<b>Annual Totals = 0, Yeah?</b>						

**Notes:**

1. Includes Honda, Boeing, Epson, Fuji Film and Swan Island Dairy

## Post-Collection Diversion

Because Metro assesses fees and taxes on disposal, the solid waste forecast needs to make important assumptions about the post-collection recovery and diversion operations at facilities.

**Please describe any known technological, market or operational changes from now until 2023 that could affect diversion rates at facilities, and by how much they might be affected.**

Diversion Rate Trends	Issues affecting post-collection diversion, how much and where...																																																																																																		
<p><b>TVWR</b></p> <table border="1"> <tr><th>Year</th><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td><td>2016</td></tr> <tr><th>Rate</th><td>~30%</td><td>~25%</td><td>~20%</td><td>~25%</td><td>~28%</td><td>~28%</td></tr> </table> <p><b>Large MRFs</b></p> <table border="1"> <tr><th>Year</th><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td><td>2016</td></tr> <tr><th>Rate</th><td>~45%</td><td>~48%</td><td>~35%</td><td>~42%</td><td>~38%</td><td>~28%</td></tr> </table> <p><b>Other MRFs</b></p> <table border="1"> <tr><th>Year</th><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td><td>2016</td></tr> <tr><th>Rate</th><td>~30%</td><td>~35%</td><td>~55%</td><td>~52%</td><td>~45%</td><td>~48%</td></tr> </table> <p><b>Pride</b></p> <table border="1"> <tr><th>Year</th><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td><td>2016</td></tr> <tr><th>Rate</th><td>~30%</td><td>~30%</td><td>~32%</td><td>~38%</td><td>~32%</td><td>~20%</td></tr> </table> <p><b>WRI</b></p> <table border="1"> <tr><th>Year</th><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td><td>2016</td></tr> <tr><th>Rate</th><td>~35%</td><td>~35%</td><td>~32%</td><td>~30%</td><td>~30%</td><td>~25%</td></tr> </table> <p><b>Central</b></p> <table border="1"> <tr><th>Year</th><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td><td>2016</td></tr> <tr><th>Rate</th><td>~35%</td><td>~38%</td><td>~32%</td><td>~32%</td><td>~30%</td><td>~18%</td></tr> </table> <p><b>South</b></p> <table border="1"> <tr><th>Year</th><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td><td>2016</td></tr> <tr><th>Rate</th><td>~15%</td><td>~15%</td><td>~15%</td><td>~12%</td><td>~10%</td><td>~8%</td></tr> </table>	Year	2011	2012	2013	2014	2015	2016	Rate	~30%	~25%	~20%	~25%	~28%	~28%	Year	2011	2012	2013	2014	2015	2016	Rate	~45%	~48%	~35%	~42%	~38%	~28%	Year	2011	2012	2013	2014	2015	2016	Rate	~30%	~35%	~55%	~52%	~45%	~48%	Year	2011	2012	2013	2014	2015	2016	Rate	~30%	~30%	~32%	~38%	~32%	~20%	Year	2011	2012	2013	2014	2015	2016	Rate	~35%	~35%	~32%	~30%	~30%	~25%	Year	2011	2012	2013	2014	2015	2016	Rate	~35%	~38%	~32%	~32%	~30%	~18%	Year	2011	2012	2013	2014	2015	2016	Rate	~15%	~15%	~15%	~12%	~10%	~8%	
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## Disposition

Metro’s current (and likely any future) disposal contract (currently Waste Management, through 2019) provides for declining block rates based on tonnage directly sent to the contractor, or “caused to be sent” to the contractor with Metro’s regulatory authority. The ability of the forecast to estimate Metro’s disposal costs, and to monitor Metro’s compliance with current and future flow guarantees to disposal contractors, is entirely dependent on these “distributions”.

Please consider any changes in policy, landfill closures (or flow restrictions to), or upcoming contractual relationships, in the period leading up to the expiry of Metro’s current disposal contract in 2019, and beyond, through the 2023 horizon, that would affect current disposal distributions. Feel free to provide qualitative rather than quantitative judgement (i.e. higher, same, a little lower, etc.) if you desire.

 Col. Ridge Riverbend			 Finley Buttes Wasco County			 Coffin Butte Roosevelt			 Cowlitz County			 COWATA ENERGY For a cleaner world		
2015	-2019	-2023	2015	-2019	-2023	2015	-2019	-2023	2015	-2019	-2023	2015	-2019	-2023

### MRF Residual<sup>1</sup>

Large MRFs	0%		66%		0%		0%		0%				
Other MRFs	19%		36%		0%		2%		0%				
Pride	100%		0%		0%		0%		0%				
WRI	0%		0%		100%		0%		0%				

### Wet

FGTS	100%		0%		0%		0%		0%				
Pride	100%		0%		0%		0%		0%				
TTS	100%		0%		0%		0%		0%				
WRI	34%		0%		62%		0%		4%				
Arrow (direct)	0%		100%		0%		0%		0%				
Kahut (direct)	100%		0%		0%		0%		0%				
Gresham	---		---		---		---		---				
COR	---		---		---		---		---				
Central	100%		0%		0%		0%		0%				
South	99%		0%		0%		0%		1%				

/1/ Note: %s for MRF Residual will not sum to unity across disposal sites because Hillsboro, a limited purpose landfill, receives significant % of waste and is not listed here.

## Feedback

This questionnaire is a work-in-progress, and represents a first attempt at soliciting the necessary inputs and assumptions that drive the Solid Waste Forecast. Please provide any feedback below for improving this questionnaire, or the process as a whole, for next year. Thanks for your time!

## **Appendix 2**



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# Oregon Economic and Revenue Forecast

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June 2016

Volume XXXVI, No. 2

*Release Date: June 3, 2016*

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**Foreword**

This document contains the Oregon economic and revenue forecasts. The Oregon economic forecast is published to provide information to planners and policy makers in state agencies and private organizations for use in their decision making processes. The Oregon revenue forecast is published to open the revenue forecasting process to public review. It is the basis for much of the budgeting in state government.

The report is issued four times a year; in March, June, September, and December.

The economic model assumptions and results are reviewed by the Department of Administrative Services Economic Advisory Committee and by the Governor's Council of Economic Advisors. The Department of Administrative Services Economic Advisory Committee consists of 15 economists employed by state agencies, while the Governor's Council of Economic Advisors is a group of 12 economists from academia, finance, utilities, and industry.

Members of the Economic Advisory Committee and the Governor's Council of Economic Advisors provide a two-way flow of information. The Department of Administrative Services makes preliminary forecasts and receives feedback on the reasonableness of such forecasts and assumptions employed. After the discussion of the preliminary forecast, the Department of Administrative Services makes a final forecast using the suggestions and comments made by the two reviewing committees.

The results from the economic model are in turn used to provide a preliminary forecast for state tax revenues. The preliminary results are reviewed by the Council of Revenue Forecast Advisors. The Council of Revenue Forecast Advisors consists of 15 specialists with backgrounds in accounting, financial planning, and economics. Members bring specific specialties in tax issues and represent private practices, accounting firms, corporations, government (Oregon Department of Revenue and Legislative Revenue Office), and the Governor's Council of Economic Advisors. After discussion of the preliminary revenue forecast, the Department of Administrative Services makes the final revenue forecast using the suggestions and comments made by the reviewing committee.

Readers who have questions or wish to submit suggestions may contact the Office of Economic Analysis by telephone at 503-378-3405.



George Naughton  
Acting DAS Director  
Chief Operating Officer

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## EXECUTIVE SUMMARY

### June 2016

On the backs of the consumer and the strengthening labor market, the U.S. economic expansion continues. Weakness and uncertainty remain in terms of the global economy, financial markets and the goods-producing industries. However, as the U.S. economy enters the seventh year of expansion, including the longest string on monthly job gains on record, the outlook remains positive. The ongoing job gains and wage growth are pulling workers back into the economy and measures of slack, or underutilization, show ongoing improvements.

Oregon continues to see full-throttle rates of growth. Job gains are outpacing the typical state as are wages for Oregon workers. The state's economy is quickly approaching full employment, or a healthy labor market. Such a milestone has not been seen since 2000. Encouragingly, underemployment, or those involuntarily working part-time in Oregon is back to pre-Great Recession rates. Given the ongoing economic strength in Oregon, the economic outlook has been raised relative to recent forecasts. The state is now expected to maintain these full-throttle rates of growth through the end of 2017 before longer-run demographics weigh on the outlook.

Absent the state's new minimum wage law, passed during the 2016 legislative session, the upward revision to the employment outlook would have been even larger. While the impact is relatively small when compared to the size of the Oregon economy, it does result in approximately 40,000 fewer jobs in 2025 than would have been the case absent the legislation. Our office is not predicting outright job losses, however we are expecting somewhat slower growth. Low-wage workers receiving raises in the near term boost incomes. Over time, however, employers will adjust by increasing worker productivity, possibly via capital for labor substitutions.

With the first income tax filing season of the 2015-17 biennium now behind us, Oregon's General Fund revenue collections remain on track with what was expected when the budget was drafted. Personal income tax collections continue to expand at a healthy pace as a result of strong job growth and wage gains. Like the overall economy, Oregon's revenue gains are among the nation's strongest, but also not a surprise.

Personal income tax collections during the filing season came in roughly the same size as last year. However, current collections reflect the payout of kicker credits. If not for the kicker, this season's collections would have been \$300 million larger than last year.

Corporate tax collections have started to contract in recent months. Nationwide, corporate profits are falling, largely due to rapid appreciation of the U.S. dollar, and struggles among energy firms and other commodity producers. Even so, corporate tax collections remain large relative to historical norms. Corporate tax revenues are expected to exceed the 2% kicker threshold by \$10.4 million, generating a kicker amount of \$32.3 million.

In addition to healthy General Fund revenue growth, Oregon Lottery sales have been very strong as well. Recent collections have consistently come in above expectations. The 2015-17 Lottery outlook has been revised upward as a result. However the forecast for future biennia has been lowered as the Cowlitz Tribe casino, scheduled to open in spring 2017, is being included in the outlook for the first time.

Although General Fund revenues have been tracking very close to expectations to date, the outlook for revenue growth during the upcoming 2017-19 biennium has become somewhat stronger. However current rates of growth are not sustainable indefinitely. As the economy reaches full employment, growth will transition to a more sustainable, long-run path. Over the 10-year forecast horizon, Oregon and other states will face considerable downward pressure on revenue growth as the baby boom population cohort works less and spends less. Revenue growth will fail to match the pace seen in the past.

## ECONOMIC OUTLOOK

### *Economic Summary*

On the backs of the consumer and the strengthening labor market, the U.S. economic expansion continues. Weakness and uncertainty remain in terms of the global economy, financial markets and the goods-producing industries (natural resources and manufacturing in particular). However, as the U.S. economy enters the seventh year of expansion, including the longest string on monthly job gains on record, the outlook remains positive. The ongoing job gains and wage growth are pulling workers back into the economy and measures of slack, or underutilization, show ongoing improvements.

Oregon continues to see full-throttle rates of growth. Job gains are outpacing the typical state as are wages for Oregon workers. The state's economy is quickly approaching full employment, or a healthy labor market. Such a milestone has not been seen since 2000. Encouragingly, underemployment, or those involuntarily working part-time in Oregon is back to pre-Great Recession rates. Given the ongoing economic strength in Oregon, the economic outlook has been raised relative to recent forecasts. The state is now expected to maintain these full-throttle rates of growth through the end of 2017 before longer-run demographics weigh on the outlook.

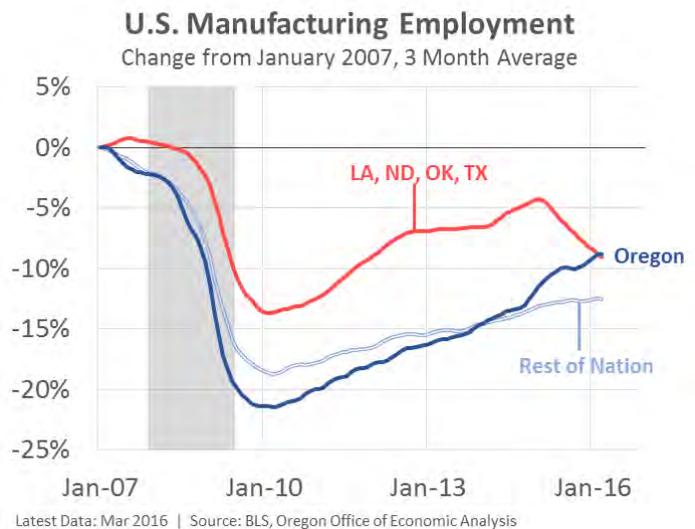
Absent the state's new minimum wage law, passed during the 2016 legislative session, the upward revision to the employment outlook would have been even larger. Using estimates provided by the Oregon Legislative Revenue Office, along with the academic literature, our office's outlook now includes a slowdown in job growth due to the higher minimum wage moving forward. While the impact is relatively small when compared to the size of the Oregon economy, it does result in approximately 40,000 fewer jobs in 2025 than would have been the case absent the legislation. Our office is not predicting outright job losses due to the higher minimum wage, however we are expecting future growth to be slower as a result. In the near term, the higher minimum wage boosts overall state income as low-wage workers receive raises. Such workers are better off due to their increased wages. Over the medium term, however, employers are expected to adjust to the higher wages and increase worker productivity, possibly via capital for labor substitutions. Our office has incorporated these overall effects into the outlook for wages and in the industries which employ low-wage workers.

### ***U.S. Economy***

On the backs of the consumer and the strengthening labor market, the U.S. economic expansion continues. Weakness and uncertainty remain in terms of the global economy, financial markets and the goods-producing industries (natural resources and manufacturing in particular). However, as the U.S. economy enters the 84<sup>th</sup> month of expansion, including the longest string on monthly job gains on record, the outlook remains positive. The ongoing job gains and wage growth are pulling workers back into the economy and measures of slack, or underutilization, continue to improve. The U.S. economy is finally nearing full employment.

Even so, the ongoing concerns in the economy remain. Global growth is weak, removing one pillar of strength in recent years in terms of exports. While financial markets have calmed since the start of the year, forward-looking measures relating to the economy signal market expectations are considerably lower than most economic forecasters, including the Federal Reserve. Finally, the manufacturing and industrial production weakness remains. Some stabilization or slight improvements are seen within goods-producing industries, however the declines experienced over the past year and a half have only occurred historically when the U.S. economy was in recession. The reason this time may be different is at least twofold.

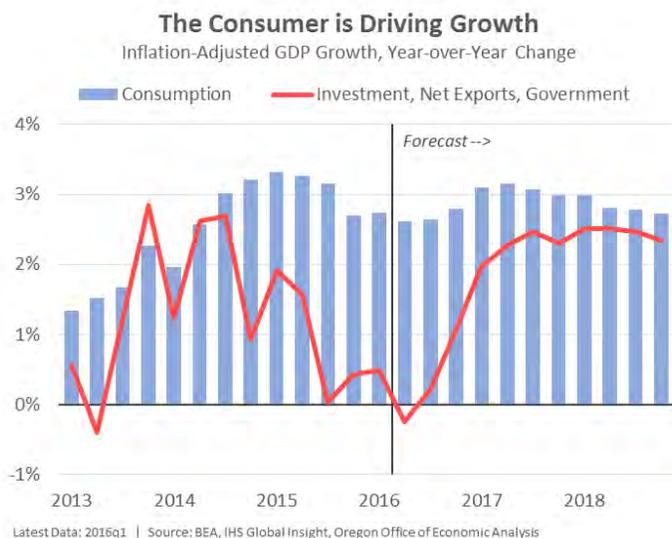
First, manufacturing represents a smaller share of the economy today than it has historically. Thus even severe fluctuations have less of an impact on the topline economic data due to compositional effects. This is not to say that manufacturing and goods-producing industries are not important. They are. However industry-specific shocks may not impact the broader economy to the same degree as they have historically. As such, the manufacturing weakness remains very concentrated in subsectors tied directly to oil and gas, which is reason number two. As the price of oil has fallen essentially in half since late 2014, mining and related suppliers (machinery, metals and the like) have pulled back. Investments in new wells has plunged as have rig counts in the oil patch states and regions. As such, the economic declines and impact remain concentrated not only within specific subsectors but also specific regions of the nation. In fact, manufacturing employment in the largest oil producing states in the nation is falling today. The rest of the nation continues to see manufacturing growth, albeit slowing due to the strong dollar and weak global economy. Oregon in particular has experienced a strong rebound since the depths of the Great Recession. Manufacturing employment today in the state is at the same relative point as in the oil-producing states, however recent trends of course diverge considerably.



Even in the face of these ongoing economic issues, the U.S. economy continues to strengthen and improve. The economy is resilient. Two related factors are driving this growth: ongoing job gains in nonmanufacturing industries and a pick-up in wages. As such, the consumer is driving economic growth today.

Most encouragingly is the meaningful increase in wage gains across the U.S. While wage growth is still lower than in past expansions, it is accelerating over the past year. As the labor market continues to improve, businesses must compete more on price to attract and retain the best workers. Rising wages are one indication this is occurring.

Additionally, a tighter labor market is resulting in increased hiring rates for the unemployed and even those not currently in the labor force. Over the past year and a half, the share of individuals who did not have a job, nor were actively looking for work, yet found a job the following month, increased considerably. Such trends generally appear the closer an economy is to full employment. As the number of unemployed decreases, businesses must cast a wider net to find and fill some positions, including potential hires that may not have been looking in the first place. Given the right opportunity, such workers move directly from not in the labor force to being employed, bypassing the unemployment stage of looking for work. While the U.S. economy is not yet fully healthy today, considerable improvement has been made in recent years and the pace of improvement remains strong.



Moving forward, expectations are that the labor market gains will continue. The oil-related drag on investment will lessen. And overall economic growth will strengthen as a result. The outlook remains positive despite the headwinds.

### ***Oregon Economy***

The pace of improvement in Oregon’s labor market continues to be full throttle. In fact, the gains in 2015 and so far in 2016 are the best in the past two decades. Over the past two years the state has added 5,000 jobs every month, which translates into 3.5 percent growth on an annual basis. Such gains are stronger than the peak of the housing boom last decade. Only the mid-1990s boom saw comparable gains. At that time, employment gains were similar, nearly 5,000 per month, however growth rates were higher due to the smaller population and employment base. Given demographic trends today, job growth north of 3 percent is as strong as can be expected.

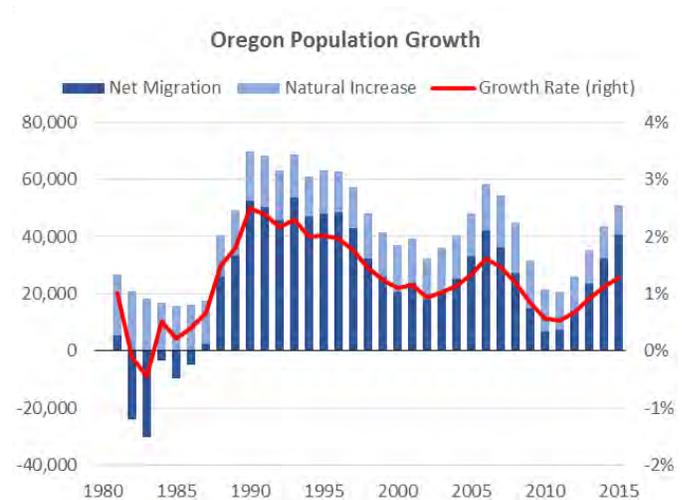
Oregon has regained its traditional advantage relative to the nation, with job growth outpacing the typical state by more than one percentage point. This growth differential largely comes from the state’s underlying fundamentals like its industrial structure and strong in-migration flows. Both of these trends have long-lasting impacts on the Oregon economy and help drive the state’s more volatile swings over the business cycle.

More importantly, these improvements are now translating into stronger wage gains for the average Oregon worker. While Oregonian income and wages are below the typical state, average wages today in Oregon are at their highest relative point since the severe early 1980s recession when the timber industry restructured. Much of this improvement has come in the past 2-3 years when Oregon wage growth, much like job growth, has outstripped the average state.

The wage gains are due to broad-based increases across all major industries and all regions of the state. Wage growth is not due to compositional effects, such as the strong growth in high-wage technology jobs or that the Portland MSA has added the most jobs, where wages are higher than in rural Oregon. While both of those trends are happening, they have surprisingly little impact on statewide average wages. This is certainly good news that the wage increases are broad-based and not isolated to certain industries or regions.

Overall, while there remains much room for improvement in average income levels in Oregon, it is important to remember that wages have not been this high, relatively, for more than a generation.

### ***Approaching Full Employment***



The Great Recession caused severe damage that has taken years to repair. However, Oregon is now quickly approaching full employment, or a healthy labor market. The state’s official unemployment rate (4.5 percent in April and May) is actually below what would historically be considered normal for Oregon during an economic expansion. However the improvements are much broader than just the unemployment rate. In fact, our office’s Total Employment Gap is currently indicating this is the best labor market Oregon has seen since the technology-led boom of the 1990s. Expectations are that this gap will fully close by late summer or early fall.



The Total Employment Gap, modeled after national work from Dartmouth’s Andrew Levin, combines the traditional unemployment rate, labor force participation, and those working part-time but want full-time work. The measure shows how far away the economy is from full employment, on a full-time equivalent jobs basis.

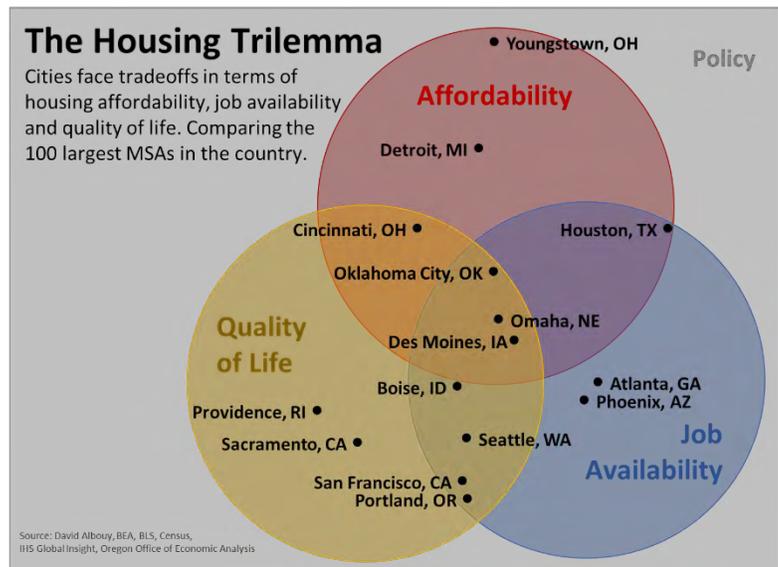
Today, not only is Oregon’s unemployment gap gone, but the share of the labor force involuntarily working part-time is back to pre-Great Recession rates, and in the actual number of such workers. The remaining slack is entirely due to the lower labor force participation rate statewide. While the majority of the decline in participation over the past 15 years is demographic – the aging Baby Boomers are entering their retirement years – some of the decline is due to the lackluster economy. Here the story is improving considerably in recent months and years. Oregon’s participation rate has increased nearly 2 percentage points off its recessionary lows. The gap between the actual participation rate and the demographically-adjusted full employment rate is now 1.8 percentage points. Back in late 2013 this participation gap was 4.6 percentage points. Progress is clearly being made. Participation is increasing as the job opportunities remain plentiful and wages are rising. Full employment in Oregon is fast approaching.



***The Housing Trilemma***

Every city wants to have a strong local economy, high quality of life and housing affordability for its residents. Unfortunately these three dimensions represent the Housing Trilemma. A city can achieve success on two but not all three at the same time. Underlying all of these tradeoffs are local policies as well.

The trilemma is very real. Among the 100 largest metropolitan areas in the nation, just eight rank among the top *half* for all three factors. None rank among the Top 20 in all three. Unless you prefer living on the Great Plains, the list of eight metros lacks sizzle.



The reason these tradeoffs exist is mostly, but not entirely, due to market forces. People want to live in cities with a strong economy and high quality of life. Increased demand for housing leads to higher prices and lower affordability. Nice places to live get their housing costs bid up due to strong demand. The opposite is true as well. Regions with underperforming economies and a lower quality of life do have better affordability.

However, even among the group of popular metropolitan areas with strong economies and a high quality of life, affordability does vary. Portland is an extreme case<sup>1</sup> with significantly more households cost-burdened and a lower vacancy rate than nearly all other metros in the nation. This impacts renters the most, including younger households and those on fixed incomes.

For these popular metros, more construction is required, but that alone is not enough. Just look at Austin, TX. Despite leading the nation’s largest metros in new construction, Austin is only able to reach middling affordability. Austin’s home prices, while lower than Portland’s or Seattle’s, are still relatively high and half of all renters are cost-burdened. Increasing construction is able to help with broad, regional affordability, but cannot fully offset the premium required to live in a popular place. In addition to building more homes, targeted programs are also needed to help less fortunate neighbors bear these costs.

The housing trilemma is real. Tradeoffs are inevitable. While Portland, and Oregon more broadly, should work to maintain its economic successes, eroding affordability does not have to be a permanent trend. Increasing construction to match a growing population and strong assistance programs are needed.

**Oregon’s Labor Market**

<sup>1</sup> <https://oregoneconomicanalysis.com/2016/04/26/portland-affordability-in-comparison/>

The Office of Economic Analysis examines four main sources for jobs data: the monthly payroll employment survey, the monthly household survey, monthly withholding tax receipts and the quarterly census of employment and wages. Right now all four measures of the labor market are showing strong improvements with jobs being added, wages increasing and the unemployment rate declining over the past year.

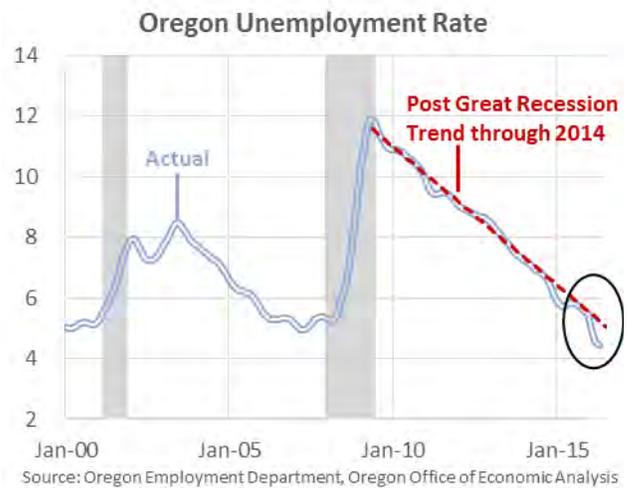
As our office has been discussing, or more accurately, warning over the past year or so, the pattern of unemployment rate changes does not likely reflect the overall pattern of growth in the Oregon economy. The annual benchmark revisions that occur each March confirmed as much for the 2015 data. The overall unemployment rate pattern was smoothed, relative to the unrevised data. However, similar issues may be at play again so far in 2016. The household survey, from which the unemployment rate is derived, shows both record labor force gains and record monthly declines in the unemployment rate. While there is no question Oregon’s economy continues to improve, future revisions may reveal a somewhat different, and smoother path for the unemployment rate.

More importantly, wages in Oregon are increasing at near double-digit rates, which is better than during the mid-2000s expansion but still a notch below the 1990s gains. Average wages per worker are currently increasing 3-4 percent per year, which is faster than inflation of 1-2 percent per year.

While national wage trends have just begun to accelerate in the past six to nine months, Oregon’s have been strong for a couple years now. Even Oregon’s average hourly earnings have accelerated in the past six months.

Previously this measure, which only began in 2007 and thus is still new, had been growing near 0 percent in inflation-adjusted terms. Given all other Oregon-specific wage data was strong, average hourly earnings was an outlier. This is no longer the case.

The most recent job growth rankings, published by Arizona State University’s W.P. Carey School of Business<sup>2</sup>, places Oregon 2<sup>nd</sup> in the nation for job growth in March. Over the past year the state has added 59,500 jobs, or an increase of 3.4 percent. Using the Oregon Employment Department’s preliminary benchmarked employment data, it shows slightly stronger figures. Oregon added 62,100 jobs over the year for a 3.5 percent growth rate, which would still rank 2<sup>nd</sup> fastest, trailing Idaho. For comparison and to show Oregon’s acceleration over the past couple of years, in 2013 Oregon ranked 11th fastest with growth of just 2.1 percent.

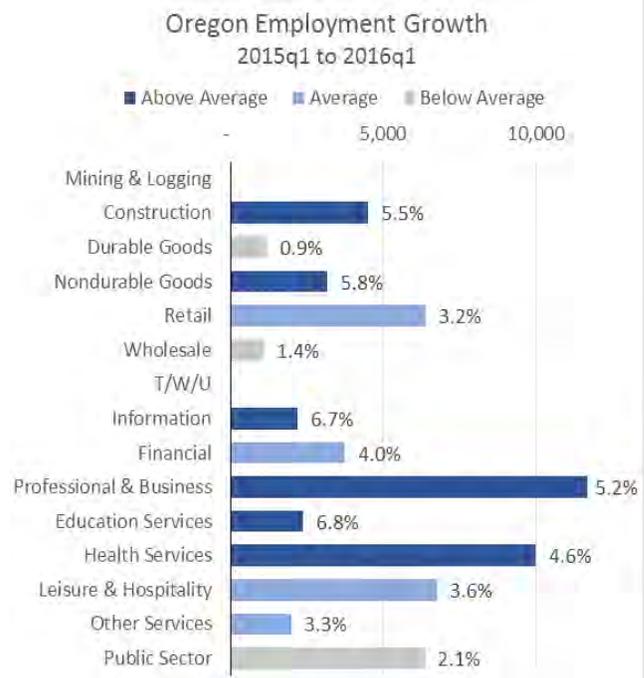


<sup>2</sup> <http://research.wpcarey.asu.edu/seidman/current-state-rankings/>

Overall, getting a handle of the health of Oregon’s labor market is being somewhat complicated by technical issues within the underlying payroll jobs data. For this reason the employment data in our office’s forecast is adjusted for two important technical purposes: seasonality at the detailed industry level and the upcoming benchmark revisions<sup>3</sup>.

In the first quarter, total nonfarm employment increased 3.4 percent over the past year with the private sector growing at 3.7 percent and the public sector at 2.1 percent. These rates of growth are essentially on par with the height of the housing boom and among the best Oregon has experienced in the past generation.

The nearby graph illustrates the number of job gains by major industry by the length of the bar. The percentage increase these changes represent is noted as well. The bars are color coded by growth rate relative to total employment growth. Industries with dark blue colored bars are growing at rates much faster than total employment, light blue bars represent industries which are growing approximately in line with the average, while grey bar industries are growing at rates significantly less than the average.



As has been the case in the recovery to date, jobs in the large service sector have led growth in terms of outright job gains and with above-average growth rates. These include jobs in professional and business services, health services, and leisure and hospitality industries. These three industries have gained 28,500 jobs in the past year and account for 47 percent of all job gains across the state. The good news is that this share is smaller than a few years ago as other industries continue to add jobs as well, which was not the case earlier in the expansion.

In terms of illustrating how each industry has fared over the Great Recession and so far in recovery, the second graph shows both the depths of recessionary losses<sup>4</sup> and where each industry stands today relative to pre-recession peak levels.

<sup>3</sup> Each year the U.S. Bureau of Labor Statistics revise the employment data – a process known as benchmarking. The current establishment survey (CES), also known as the monthly payroll survey, is benchmarked against the quarterly census of employment and wages (QCEW), a series that contains all employees covered by unemployment insurance. The monthly CES is based on a sample of firms, whereas the QCEW contains approximately 96 percent of all employees, or nearly a complete count of employment in Oregon. The greatest benefit of the CES is the timeliness – monthly employment estimates are available with only a one month lag – and these estimates are reasonably accurate. However the further removed from the latest benchmark, the larger the errors. The QCEW is less timely as the data is released approximately 3-4 months following the end of the quarter. The greatest benefit of the QCEW is that is a near 100 percent count of statewide employment. For these reasons, the CES is usually used to discuss recent monthly employment trends, however once a year the data is revised to match the historical QCEW employment trends. The last month of official benchmark data is September 2015. The QCEW is currently available through December 2015, thus the preliminary benchmark used here covers the October 2015 – December 2016 period.

<sup>4</sup> Each industry’s pre-recession peak was allowed to vary as, for example, construction and housing-related industries began losing jobs earlier than other industries or the recession’s official start date per NBER.

Currently, eight major industries are at all-time highs. Private sector food manufacturing, education, and health never really suffered recessionary losses – although their growth did slow during the recession. Professional and business services and leisure and hospitality have each regained all of their losses and are leading growth today. In recent months both retail employment, other services and the public sector have surpassed their pre-recession levels and are at all-time highs. The seven private sector industries at all-time highs account for 55 percent of all statewide jobs. The public sector accounts for an additional 17 percent of all jobs.

With the Great Recession being characterized by a housing bubble, it is no surprise to see wood products, construction, mining and logging and financial services (losses are mostly real estate agents) among the hardest hit industries. These housing and related sectors are now beginning to recover, although they still have much ground to make up. Transportation equipment manufacturing suffered the worst job cuts and is likely a structural decline due to the RV industry’s collapse<sup>5</sup>. With that being said, the subsectors tied to aerospace are doing well and the ship and boat building subsector is growing again. Metals and machinery manufacturing, along with mining and logging, have shown the largest improvements since the depths of the recession.

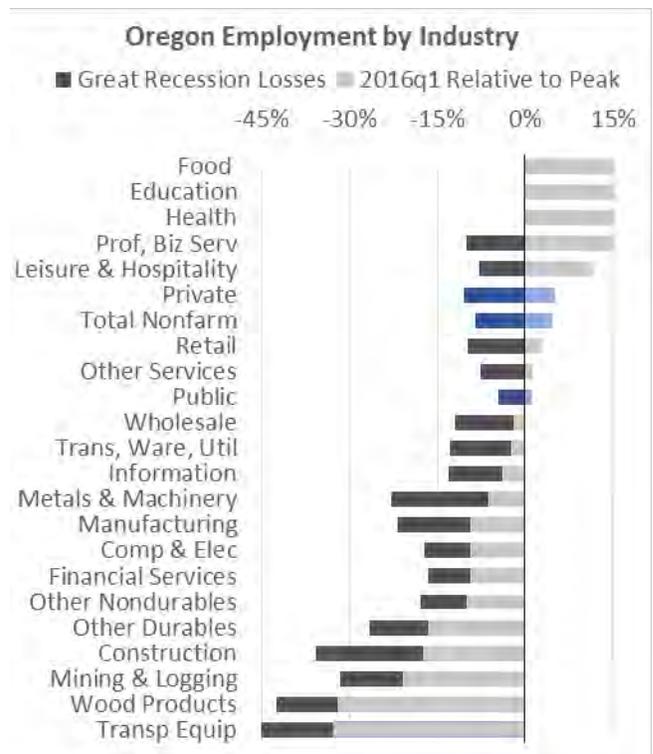
Coming off such a deep recession, and with a strong manufacturing cycle today, the goods-producing industries have and will exhibit stronger growth than in past cycles. Although, even with relatively strong manufacturing gains today, the industry is unlikely to fully regain all of its lost jobs. Oregon manufacturers typically outperform those in other states, in large part due to the local industry make-up. Oregon does not rely upon old auto makers or textile mills. The state’s manufacturing industry is comprised of newer technologies like aerospace and semiconductors. Similarly Oregon’s food processing industry continues to boom.

All told, each of Oregon’s major industries has experienced some growth in recovery, albeit uneven. As the economy continues to recover there will be net winners and net losers when it comes to jobs, income and sales. Business cycles have a way of restructuring the economy.

*For additional information on the most recent quarter’s employment forecast errors, please refer to Table A.1 in Appendix A.*

**Leading Indicators**

Both of the Oregon-specific composite leading indicators have turned up in recent months, following a period where each was more of a mixed bag. Our office’s Oregon Index of Leading Indicators (OILI) and the University of Oregon’s Index of Economic Indicators were essentially flat, or unchanged, from about mid-2014 to late-2015.



<sup>5</sup> <http://oregoneconomicanalysis.com/2012/07/10/rv-workers-and-reemployment/>

The unchanged topline hid a stark divergence between manufacturing, or goods producing, indicators and all other types. However, as some of the manufacturing indicators begin to improve, the overall indices are as well.

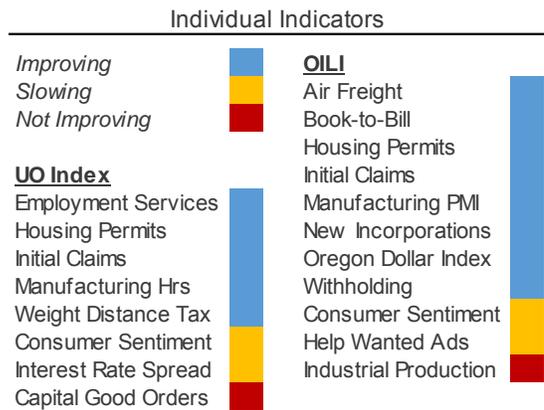
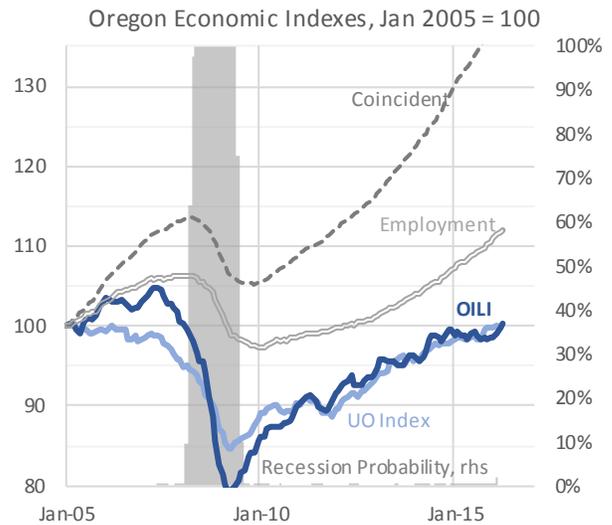
Specifically, the book-to-bill ratio for semiconductor equipment manufacturers, industrial production, manufacturing purchasing managers index, and the Oregon dollar have all seen improvements in the past month or two. New orders for capital goods excluding aircraft remains weak, however. While the relatively good news from these manufacturing indicators is encouraging, it is still premature to assume the downside risks have truly abated. Even so, not all goods producing indicators are negative. Oregon’s weight distance tax and the Port of Portland’s air freight tonnage continue to increase, reflecting overall economic activity, and the average manufacturing workweek is holding strong at 40 hours per week.

Nearly every other indicator remains positive. In fact, labor market measures look exceptionally strong, as initial claims for unemployment are at or near record lows, temporary agency employment continues to grow and withholding tax receipts out of Oregonian paychecks remains very robust. Additionally, housing permits continue to increase and the number of new businesses forming in Oregon is on the rise again. These indicators paint a brighter picture of the economy today and moving forward.

Right now the U.S. economy is not in recession. University of Oregon professor Jeremy Piger has created a real time probability of recession<sup>6</sup> model, and finds there is just a 1.8 percent chance the U.S. has entered into a recession. However, another recession will come, of that we can be sure. IHS Global Insight puts the probability of recession over the next year at 20 percent, and the Wall Street Journal consensus is at also at 20 percent. Hopefully Oregon’s leading indicators will give a signal in advance of the next recession, which neither is doing today.

While past experience is no guarantee of future performance, Oregon’s leading indicator series do have a good track record in their brief history. Both series flattened out in 2006 and began their decline in advance of the Great Recession. Similarly both Oregon series reached their nadir in March 2009, a few months before the technical end of the recession (June 2009 per NBER) and about 9 months in advance of job growth returning to Oregon.

**Short-term Outlook**



<sup>6</sup> [http://pages.uoregon.edu/jpiger/us\\_recession\\_probs.htm/](http://pages.uoregon.edu/jpiger/us_recession_probs.htm/)

Robust job growth continues in Oregon. Since the beginning of 2013, Oregon job growth has picked up from around 1.5 to 2.0 percent to more than 3.0 percent today. The outlook calls for this growth to persist for another year and a half before longer-run demographic trends weigh on growth. While consistent with the general character of recent forecasts, this marks an upward revision to the employment outlook. Previously our office expected the deceleration in job growth to happen in early to mid-2017. Now, our office expects this to occur at the end of 2017. Wages and incomes remain relatively unchanged to previous outlooks.

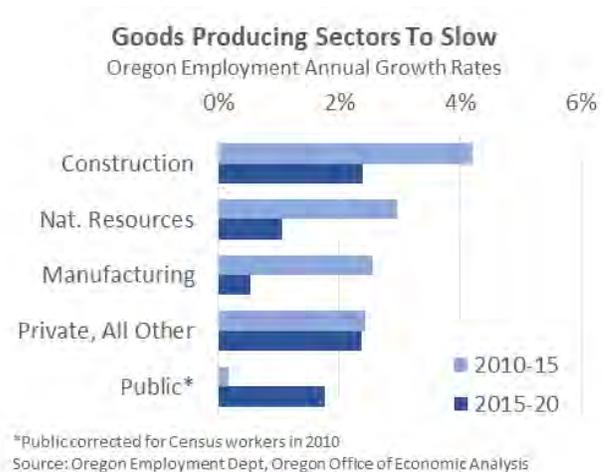
Absent the state’s new minimum wage law, passed during the 2016 legislative session, the upward revision to the employment outlook would have been even larger. Using estimates provided by the Oregon Legislative Revenue Office, along with the academic literature, our office’s outlook now includes a slowdown in job growth due to the higher minimum wage moving forward. While the impact is small when compared to the size of the Oregon economy, it does result in approximately 40,000 fewer jobs in 2025 than would have been the case absent the legislation. Our office is not predicting outright job losses due to the higher minimum wage, however we are expecting future growth to be slower as a result. In the near term, the higher minimum wage boosts overall state income as low-wage workers receive raises. Over the medium term, employers are expected to adjust to the higher wages and increase worker productivity, possibly via capital for labor substitutions. Our office has incorporated these overall effects into the outlook for wages and in the industries which employ the largest numbers of low-wage workers. These include the obvious like leisure and hospitality, and retail trade, but also health care and food processing manufacturing, among others.

Should this overall economic outlook come to pass, it will match the equivalent of previous expansions in Oregon. Given demographic trends today, particularly the aging Baby Boomer cohort, job growth of 3 percent is considered full throttle. In decades past, growth of 4 or 5 percent was common during expansions in Oregon, however that time period also coincided with the Baby Boomers entering their prime working years. Today the opposite is occurring. Even so, demographic trends are not all bad, as the even larger cohort of Millennials are currently entering their prime working years. The net effect is overall lower rates of labor force and economic growth, due to demographics.

Private sector growth, measured by the number of jobs created, will be dominated by the large, service sector industries like professional and business services, leisure and hospitality and health.

Nevertheless, goods-producing industries, while smaller, have been growing at above-average rates. However, this is expected to change moving forward. All three major goods-producing industries are expected to grow slower in the coming years than they have seen in the recent past. Only construction is expected to add jobs at the same pace as the rest of the private sector, as the housing rebound continues.

Manufacturing in particular is expected to experience very minimal gains in the coming years. Not only is Intel, the state’s largest private employer, downsizing, much, if not all of the cyclical rebound in manufacturing has run its course. The weak global economy and strong Oregon dollar will weigh on growth. What manufacturing gains are expected are among the state’s food processors, and beverage manufacturers, predominantly breweries.



The baseline outlook does not call for outright manufacturing job losses overall, however that does remain a distinct possibility and risk to the outlook.

Public sector employment at the local, county and state level for both education and non-education workers has recently begun growing in Oregon, as state and local revenues continue to grow along with an improving economy. Over the forecast horizon, government employment is expected to grow roughly stay in line with population growth and the increased demand for public services, albeit a little faster than population growth alone. One risk to the outlook is the recent Oregon Supreme Court decision which reversed earlier Public Employees Retirement System (PERS) changes enacted by the Legislature. The extent to which the court decision will impact hiring by local and state public entities is unknown, but it is a risk to the outlook.

## Economic Forecast Summary

		Quarterly					Annual				
		2016:1	2016:2	2016:3	2016:4	2017:1	2015	2016	2017	2018	2019
<b>Personal Income, Nominal</b>	U.S.	3.9	3.4	3.9	4.8	5.5	4.4	3.9	4.9	5.1	5.0
<i>% change</i>	Oregon	6.1	6.5	5.8	6.3	6.6	5.8	5.5	6.5	6.4	5.7
<b>Wages and Salaries, Nominal</b>	U.S.	3.8	5.3	5.2	5.3	5.4	4.6	4.6	5.3	4.8	4.6
<i>% change</i>	Oregon	9.1	8.5	7.2	6.9	7.1	6.6	7.1	7.2	6.4	5.3
<b>Population</b>	U.S.	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
<i>% change</i>	Oregon	1.1	1.3	1.5	1.1	1.1	1.3	1.3	1.2	1.2	1.2
<b>Housing Starts</b>	U.S.	1.15	1.18	1.21	1.26	1.33	1.11	1.20	1.39	1.50	1.55
<i>U.S. millions, Oregon thousands</i>	Oregon	19.2	18.0	18.6	19.5	20.5	16.0	18.8	21.4	22.9	23.1
<b>Unemployment Rate</b>	U.S.	4.9	4.9	4.8	4.8	4.7	5.3	4.8	4.7	4.7	4.9
	Oregon	4.8	4.9	4.9	5.0	5.0	5.8	4.9	5.1	5.3	5.4
<b>Total Nonfarm Employment</b>	U.S.	1.9	1.7	1.7	1.8	1.4	2.1	1.9	1.4	0.9	0.8
<i>% change</i>	Oregon	4.6	3.4	3.1	3.1	3.0	3.3	3.5	3.0	2.0	1.0
<b>Private Sector Employment</b>	U.S.	2.1	2.0	2.0	2.1	1.6	2.4	2.1	1.6	0.9	0.7
<i>% change</i>	Oregon	4.9	3.0	3.3	3.4	3.3	3.5	3.7	3.2	2.1	1.0

Along with an improving labor market, stronger personal income gains will come. 2013 personal income is estimated to have increased by just 1.6 percent. This largely reflects the pulling forward of investment-type income into 2012 in anticipation of increased federal tax rates in 2013. Personal income rebounded strongly in 2014, with gains of 5.7 percent, followed by 5.8 percent growth in 2015. Continued strong gains are expected moving forward, along with a full throttle economic expansion. Income growth is forecasted to be 5.5 percent in 2016 and 6.5 percent in 2017.

As the economy continues to improve, household formation is increasing too, which will help drive up demand for new houses. Household formation was suppressed earlier in the recovery, however the improving economy and increase in migration have returned in full force. Even as more young Oregonians are living at home, as the Millennials continue to age beyond their early 20s, demand for housing will increase as well.

Housing starts in the first quarter totaled 19,200 at an annual pace, the highest figures seen since 2007. However, a level of about 21,000 is the long-run average for the state prior to the housing bubble, and the forecast calls for strong growth in the coming few years with starts reaching nearly 19,000 in 2016 and nearly 23,000 in 2017. Over the extended horizon, starts are expected to average a little more than 23,000 per year to meet demand for a larger population and also, partially, to catch-up for the underbuilding that has occurred in recent years. As of today, new home construction is cumulatively about one year behind the stable growth levels of prior decades even after accounting for the overbuilding during the boom.

*A more complete summary of the Oregon economic outlook and forecast changes relative to the previous outlook are available as Table A.2 and A.3 in Appendix A.*

### **Forecast Risks**

The economic and revenue outlook is never certain. Our office will continue to monitor and recognize the potential impacts of risk factors on the Oregon economy. Although far from comprehensive, we have identified several major risks now facing the Oregon economy in the list below:

- Federal fiscal policy. Federal fiscal policy remains a risk. The good news for Oregon is that outside of outright land ownership, the federal government has a relatively small physical presence in the state. This means that direct spending reductions are less likely to hurt Oregon. Of course, it also limits the local benefit from any potential increases in federal spending. In terms of federal grants as a share of state revenue, Oregon ranks 29th highest. For federal procurement as a share of the economy, Oregon ranks 48th highest. Oregon ranks below average in terms of military-dependent industries as well. The one area that Oregon ranks above average is in terms of direct federal employment, ranking 19th highest among all states. Oregon also is exposed to an above-average share of federal transfer payments to households. Transportation funding is also a major local concern. Overall, the direct impact may be less than in other states but the impact will be felt nevertheless, particularly as our closest neighbors have large federal and military workforces.
- Strength and durability of the housing market recovery. The housing market in recent years has undergone an unusual pattern of growing briskly (2012) to stalling out (2013) to recovering with moderate growth (2014.) How long this lasts and what strength of gains has direct implications for regional economies within in the state – namely the medium sized metros and more rural areas. As the recovery continues, some of the same underlying dynamics of growth will reappear. Chief among them is low inventory, which is not keeping up with demand. As such, home prices are rising. There remains much more room for improvement before the market (sales of both existing homes and new construction activity) reflects anything approaching normal levels. While foreclosures and long-term delinquency rates remain somewhat elevated, when compared with pre-recession levels, the market has certainly passed the peak of foreclosures and is working through the backlog of distressed properties. Oregon, with the rest of the nation, will see sizable improvements of construction activity in 2015 and 2016.
- Even as the housing market recovers, new supply entering the market has not kept up with demand (both from new households and investor activity.) This applies to both the rental and ownership sides of the market. As such, prices have risen considerably and housing (in)affordability is becoming a larger risk to the outlook. Expectations are that new construction will pick up in the next year or three, to match the increase in demand, which will alleviate price pressures. However to the extent that supply does not match demand, home prices and rents increasing significantly faster than income or wages for the typical household is a major concern.
- The drought impacting much of the West Coast and Southwestern U.S. is a risk to the outlook. Its impact on the California economy reached into the billions of dollars in 2014 and is expected to increase in cost and size in 2015. The drought has reached Oregon as well and most eastern and/or southern counties

are classified accordingly. The impact is most felt within the agriculture industry. Losses are expected to be concentrated more in the grains, feed and other crops in addition to cattle. Fruits, nuts and dairies to be less impacted. The severity and duration of the drought is unknown, however it remains a risk to Oregon's rural economies in particular.

- Ongoing European debt problems and potential financial market contagion or instability. The European high debt, low growth, austerity cycle has continued, more or less, for the past four years. So long as Europe is able to continue to muddle through the process, the situation acts as a drag on domestic and global economic growth, however no more so than it already is. With that being said, the potential for another financial crisis unfortunately still looms large as a catastrophic scenario. Domestic credit markets are easing, but consumers and businesses still have difficulty getting loans. To the extent that credit markets take longer to come back to some sort of state of normalcy, the current recovery could be slower than projected or thrown off track. In such a scenario, Oregon will suffer the consequences along with the rest of the nation.
- Commodity price inflation. Prices for many major commodities are trending down, but remain atypically high from a historical perspective. Future commodity prices will be tied to growth. Should the global expansion pick up speed, a return to high rates of commodity inflation is possible. Always worrisome is the possibility of higher oil (and gasoline) prices. While consumer spending has held up pretty consistently in this recovery, anytime there is a surge in gas prices, it eats away at consumers' disposable income, leaving less income to spend on all other, non-energy related goods and services.
- Federal timber payments. Even with the temporary reinstatement, it has been and it is clear that federal policymakers will not reinstate the program the same as before, however negotiations are ongoing for more sustainable timber harvests and related revenue. In the meantime, reductions in public employment and services are being felt in the impacted counties. For more information from a historical perspective, see two recent blog posts, [here](#) and [here](#)<sup>7</sup>.
- Global Spillovers Both Up and Down. The international list of risks seems to change by the day: sovereign debt problems in Europe, equity and property bubbles in places like South America and Asia, political unrest in the Middle East and Ukraine, and commodity price spikes and inflationary pressures in emerging markets. In particular, with China now a top destination for Oregon exports, the state of the Chinese economy – and its real estate market – has spillover effects to the Oregon economy. The recent economic slowdown across much of Asia is a growing threat to the Pacific Northwest's growth prospects.
- Undoing the Federal Policy Used to Combat the Financial Crisis and Recession. Bailouts, tax cuts, monetary quantitative easing, and other fiscal packages most likely prevented a more serious economic downturn. But the clean-up after the storm can have its own risks to the economy. Exit strategies will have to be carefully implemented to prevent premature tightening and choking off the recovery or acting too late to avoid an inflationary environment. All states, including Oregon, face the same risks.

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<sup>7</sup> <http://oregoneconomicanalysis.wordpress.com/2012/01/23/historical-look-at-oregons-wood-product-industry>  
<http://oregoneconomicanalysis.wordpress.com/2013/05/28/timber-counties/>

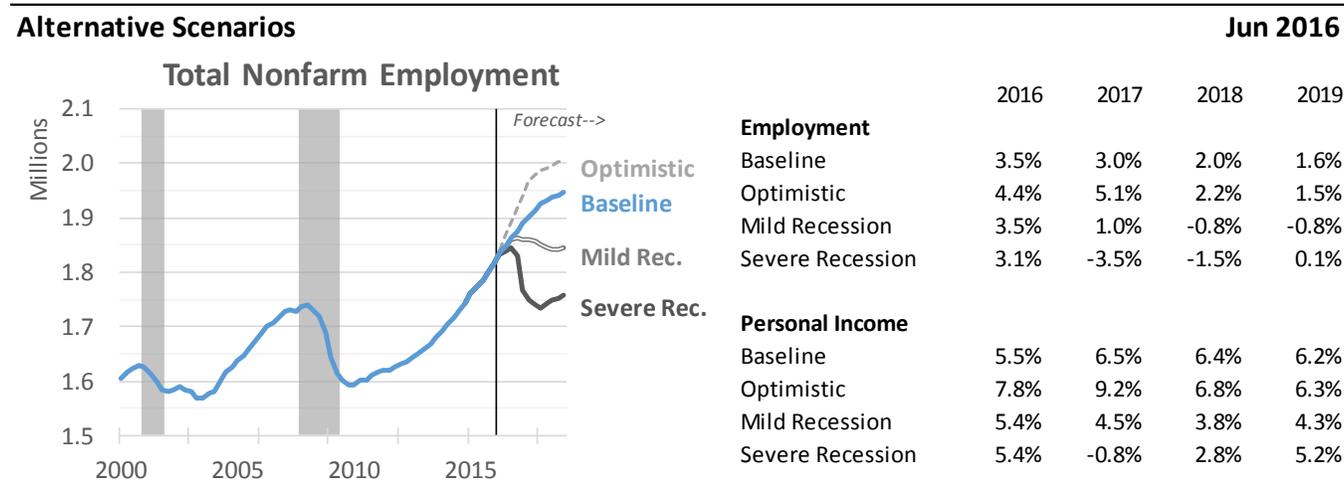
- Initiatives, referendums, and referrals. Generally, the ballot box and legislative changes bring a number of unknowns that could have sweeping impacts on the Oregon economy and revenue picture.

### Alternative Scenarios

The baseline forecast is our outlook of the most likely path for the Oregon economy. As with any forecast, however, many other scenarios are possible. In conjunction with the Legislative Revenue Office, this forecast provides three alternative scenarios, which are modeled on growth patterns over previous business cycles.

**Optimistic Scenario:** The recovery gathers steam and pulls the economy into a stronger cyclical expansion. The lackluster economic growth seen in the early stages of recovery, and the manufacturing weakness in 2015 recedes into the rearview mirror of history and the U.S. economy builds momentum throughout 2016. The economy is soon firing on all cylinders. Economic growth is above potential in 2016 and 2017, resulting in stronger job and income gains. This stronger growth leads to more consumer spending and more business investment.

In Oregon, job gains are broad based with strong growth in all private sector industries. The unemployment rate remains lower than under the baseline scenario as individuals are able to find employment more readily and income growth accelerates. The labor force participation gap closes. The increase in employment and income support a self-sustaining economic expansion in which new income fuels increased consumer spending (and debt reduction) which begets further increases in employment. Such an expansion increases housing demand as newly employed households (and increasing income for existing households) find their own homes after doubling-up with family and friends during the recession. This results in new construction returns to normal levels by mid-2016 or about a year earlier than the baseline.



**Mild Recession Scenario:** The economic acceleration of the past two years proves temporary and soon Oregon is returning to very slow employment and GDP growth in 2016. The housing market stalls (again), removing one driver of growth. The Fed’s tightening in late-2015 and mid-2016 causes emerging market turmoil and capital flight. The U.S. dollar strengthens further, choking off the manufacturing cycle. These factors are enough weight on the lackluster recovery that mid to late-2016 the economy slides back into recession. Job losses ensue in 2017, and while not severe – about 17,000 jobs in Oregon – it takes a toll on business income, housing starts and personal income. The unemployment rate returns to 7.5 percent. The net effect of the mild recession is an

extended period of prolonged economic weakness, not unlike Japan's so-called Lost Decade(s). Although inflation is expected to remain positive, a key difference.

**Severe Recession Scenario:** The economy is not able to reach escape velocity from the lackluster recovery to date, and with a newly stalled housing recovery removing one pillar of growth, increasing turmoil in domestic and international markets, and the Fed's premature tightening in 2015 and again in 2016, the economy is soon in free-fall. While the catalyst may be different, the economic effect is similar to late 2008 and early 2009, although not quite as severe when the dust settles. This is little comfort when the unemployment spikes back to 10 percent and more than 100,000 Oregonians lose their jobs in 2017-18. Besides the domestic economic headwinds and Federal Reserve tightening, the likely culprit in this scenario is a meltdown of the financial markets sparked by the European sovereign debt crisis or other geopolitical shock. Economic growth in the U.S., while fairly steady, is not nearly strong enough to withstand an external financial shock of this magnitude. Further economic effects of a recession this size are personal income losses of around 4.8 percent, about three-quarters the size of the Great Recession losses in Oregon. Housing starts plummet to near historical low levels of construction and home prices decline further. On the bright side, when construction does rebound, it will result in a surge of new home building that will rise above the state's long term average level of building due to pent-up demand for housing and that the state will have under built housing during this time period.

### ***Extended Outlook***

IHS Economics projects Oregon's economy to fare well relative to the rest of the country in the coming years. The state's Real Gross State Product is projected to be the sixth fastest among all states across the country in terms of growth with gains averaging 2.9 percent through 2021. Total employment is expected to be the eighth strongest among all states at an annualized 1.6 percent, while manufacturing employment will be the third fastest in the country at 1.4 percent. Total personal income growth is expected to be 5.1 percent per year, the eleventh fastest among all states, according to IHS Economics.

OEA is somewhat more bullish as our office expects the peak growth rates in the economy to persist longer than does IHS. Oregon will also maintain a growth advantage relative to other states. However, this advantage will be somewhat smaller than the state has enjoyed in past decades. OEA has identified three main avenues of economic growth that are important to continue to monitor over the extended horizon: the state's dynamic labor supply, the state's industrial structure and the current number of start-ups, or new businesses.

Oregon has typically benefited from an influx of households from other states, including an ample supply of skilled workers. Households continue to move to Oregon even when local jobs are scarce, as long as the unemployment rate is equally bad elsewhere (particularly in California). Relative prices of housing also contribute to migration flows in and out of the state. For Oregon's recent history – data available from 1976 – the labor force in the state has both grown faster than the nation overall and the labor force participation rate has been higher. However while recent months have brought considerable improvements there remain potentially worrisome signs, particularly when the next recession comes.

First, on the bright side, all of the recessionary-induced declines in the labor force itself have been reversed in the past two years. Oregon's labor force has never been larger. However, the participation rate remains lower than expected, when adjusting for the size of the population and the aging demographics. Oregon's participation rate is rebounding today, which is great news, however the participation gap is still cause for concern. While much of the past decade's patterns can be attributed to the severe nature of the Great Recession, and even the

lackluster housing boom itself, some of the damage is likely to be permanent. The longer the expansion continues, the more likely the permanent damage will be small.

All told, our office’s baseline outlook calls for some continued improvement in the near-term for both the labor force participation rate and the employment to population ratio. These gains are due to the shorter run cyclical rebound in the economy, before longer-run demographic trends will weigh on these measures. Focusing just on the prime working age cohorts reveals stronger improvements.



Oregon’s industrial structure is very similar to the U.S. overall, even moreso than nearly all other states. Oregon’s manufacturing industry is larger and weighted toward semiconductors and wood products, relative to the nation which is much more concentrated in transportation equipment (autos and aerospace). However, these industries which have been Oregon’s strength in both the recent past and historically, are now expected to grow the slowest moving forward. Productivity and output from the state’s technology producers is expected to continue growing quickly, however employment is not likely to follow suit. Similarly, the timber industry remains under pressure from both market based conditions and federal regulations. Barring major changes to either, the slow to downward trajectory of the industry in Oregon is likely to continue.

With that being said, certainly not all hope is lost. Many industries in which Oregon has a larger concentration than the typical state are expected to perform well over the coming decade. These industries include management of companies, food and beverage manufacturing, published software along with gains in crop production and nurseries. The state’s real challenges and opportunities will come in industries in which Oregon does not have a relatively large concentration (the orange bars in the graph). These industries, like consulting, computer system design, financial investment, and scientific R&D, are expected to grow quickly in the decade ahead. To the extent that Oregon is behind the curve, then the state may not fully realize these gains if they rely more on clusters and concentrations of similar firms that may already exist elsewhere in the country.



Industry concentration = 2012 employment location quotient at 4 digit NAICS level  
Each column represents approximately 1/11 of Oregon traded sector employment  
Source: BLS, Oregon Employment Department, Oregon Office of Economic Analysis calculations

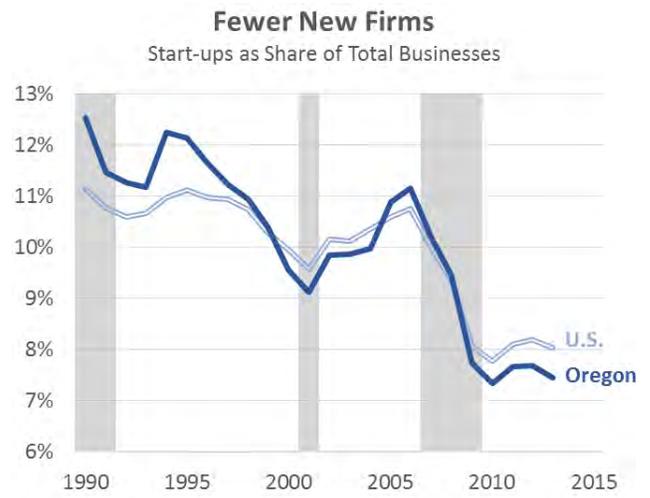
Another area of potential concern that may impact longer term economic growth is that of new business formation. Over the past year or two, the number of new business license applications with the Oregon Secretary of State have begun to grow again and even accelerate. However data available from the U.S. Census Bureau and Bureau of Labor Statistics clearly indicate that entrepreneurship and business formation remain at subdued levels and rates.

The share of all businesses that are start-ups, either in Oregon or across the nation, is effectively at an all-time low, with data starting in the late 1970s. Associated start-up employment follows a similar pattern. The concern is that new businesses are generally considered the source of innovation and new ideas, products and services that help propel economic growth. To the extent that lower start-up rates indicates that R&D more broadly is not being undertaken, slower growth is to be expected moving forward. However, if the larger firms that have won out in today's marketplace are investing in R&D and making those innovations themselves, then the worries about the number of start-ups today is overstated. It can be hard to say which is the correct view. However seeing these longer run, downward trends in new business formation warrants, at the very least, concern about future growth prospects.

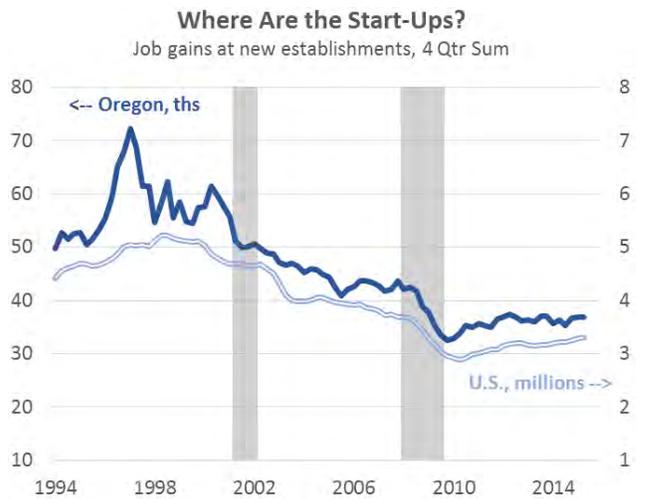
Finally, Oregon also enjoys the long-term advantages of low electricity costs; a central location between the large markets of California, Vancouver and Asia; clean water; low business rents and living costs; and an increasingly diverse industrial base.

One primary long-run concern for policymakers, think tanks and Oregon's economy is that very little progress on raising per capita income is projected out to 2025. In and of itself, a higher per capita income level would better fund public services for citizens. The benefit side of the state's relatively low income figures is that local firms do not have to pay higher wages, thus helping support the firms' balance sheets as well. It is not purely a lose-lose proposition. The Oregon Employment Department has published<sup>8</sup> a detailed look at Oregon's per capita personal income.

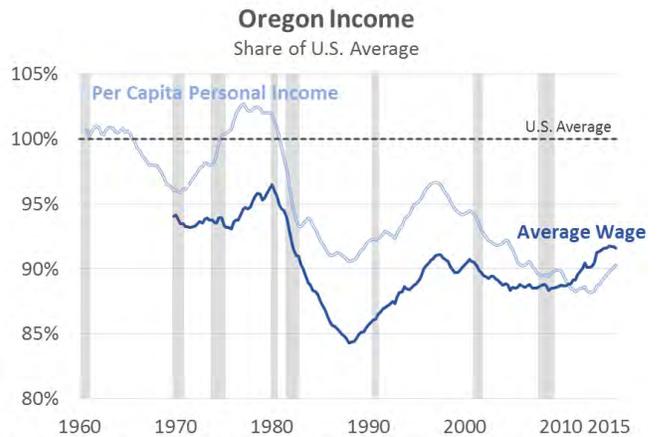
While the state's per capita income remains low, the state's average wage does not. Today, Oregon's average wage relative to the nation, is at its highest point since the mills closed in the 1980s. While some industries are seeing stronger growth, these gains are broad-based across regions and industries in Oregon.



Source: Census Bureau, Oregon Office of Economic Analysis



Source: BLS, Oregon Office of Economic Analysis



Latest data: 2015q4 | Source: BEA, IHS Global Insight, Oregon Office of Economic Analysis

<sup>8</sup> <http://olmis.emp.state.or.us/olmisj/PubReader?itemid=00007366>

## Oregon Regional Trends

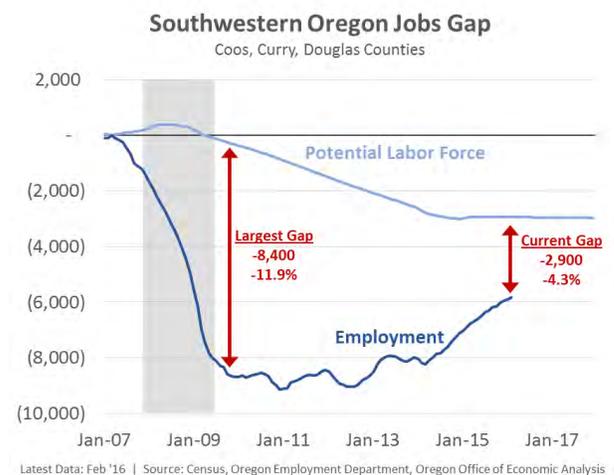
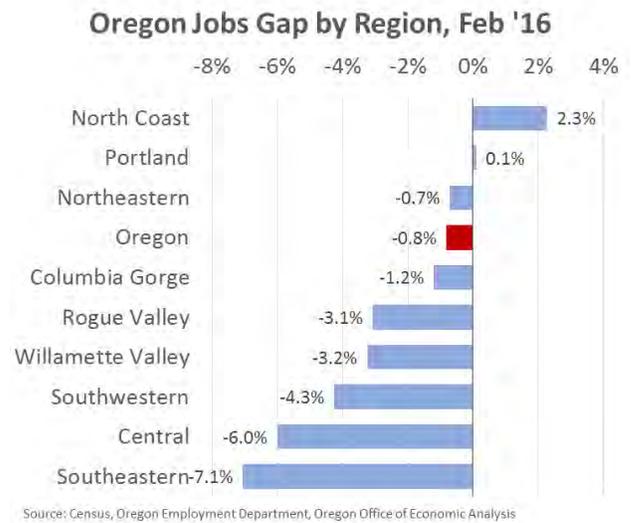
Job growth has returned to all regions in Oregon and in many, employment has surpassed pre-Great Recession levels. However that alone does not indicate the economy is fully healthy. For most regions, the population continued to grow even as the economy cratered. Our office's Jobs Gap measure compares the actual number of jobs in a region with the amount needed to keep pace with a growing population. This is based on an estimate of the potential labor force which takes into account local demographics and the aging of the population.

Today in Oregon only two regional economies – the North Coast and Portland MSA – have a positive Jobs Gap, indicating they have added enough local jobs to match or exceed population gains. While the Portland region has had record employment numbers for a couple of years, it was just recently that the growth caught up to the population gains of the past decade.

The remaining regions in the state fall into two groups. The first group consists of Central Oregon and the Rogue and Willamette Valleys. These regions have seen strong job growth but just not enough to match population gains. Central Oregon in particular experienced some of the largest job losses in the nation during the recession. While robust gains in recent years are impressive, population growth has returned. These regional Jobs Gaps are narrowing quickly, however they have not closed just yet. Expectations are they will by late 2016 or early 2017.

The second group consists of both Southeastern and Southwestern Oregon. These regions suffered severe job losses and have only seen modest gains so far in recovery. In Southwestern Oregon, the Jobs Gap has closed half due to job gains and half due to the potential labor force shrinking. As bad as demographic trends can be in rural America, in many places in Oregon the vast majority of the impact on the economy has already taken place. Aging from 60 to 70 years old has the largest labor market impact. Moving forward, demographic trends will actually be better and more supportive of growth for this very reason than many realize.

For more Jobs Gap, please visit our website: <https://oregoneconomicanalysis.com/2016/03/29/oregon-jobs-gap-by-region/>.



## **Appendix 3**

## Appendix 3: Detailed Forecast Data

This appendix provides detail on each of the major tonnage aggregates forecasted by the model, as well as performance statistics on the last forecast and comparison of last and current forecast.

### Economy, Generation & Source-Separation

#### Calendar Year Forecast

(tons, unless otherwise specified)

	Calendar Year											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Economic Drivers (change, %)</b>												
Employment	1.2	2.1	2.9	3.3	3.5	3.0	2.0	1.0	0.9	0.7	0.7	0.6
Home Price Index	(0.4)	7.2	8.8	9.4	9.3	7.9	4.5	3.6	3.4	3.4	3.3	2.9
Residential Home Starts	35.5	31.5	9.3	2.6	17.9	13.4	7.3	1.0	2.9	1.5	0.2	(0.8)
<b>Generation</b>												
Regional Tons	2,180,153	2,275,564	2,219,152	2,330,109	2,434,964	2,515,318	2,565,624	2,614,371	2,653,587	2,688,083	2,714,964	2,728,539
Change (%)	4.4	4.4	(2.5)	5.0	4.5	3.3	2.0	1.9	1.5	1.3	1.0	0.5
<b>Source-Separation &amp; Recovery</b>												
Source-Separation	1,097,181	1,160,757	1,042,405	1,072,193	1,051,311	1,087,720	1,119,035	1,144,377	1,165,605	1,184,796	1,196,400	1,202,259
Post-Collection	124,843	118,233	136,354	154,894	138,524	137,234	139,210	141,071	142,392	143,437	144,058	143,960
Program Credits (% toward RR)*	6%	6%	6%	6%	0%	0%	0%	0%	0%	0%	0%	0%
Recovery Rate	62.1%	62.2%	59.1%	58.7%	48.9%	48.7%	49.0%	49.2%	49.3%	49.4%	49.4%	49.3%

(shaded values are forecasts)

\*The State of Oregon calculates an annual recovery rate for the Metro “wasteshed” (defined as the entirety of Clackamas, Multnomah and Washington counties). This recovery rate historically included 6% in credits for the region’s waste prevention, reuse and backyard composting efforts. The Oregon Legislature passed statutory language in 2015 that eliminated the credits, effective 2016.

# Delivery Tonnage

## Last Forecast Performance

(tons, unless otherwise specified)

	Month/Year								Cumulative Difference	
	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Dec-15 - Jul-16	
									Tons	%
<b>Delivery Tonnage</b>										
<b>Private Core</b>										
<b>Wet</b>										
Actual	37,398	34,053	33,182	37,310	35,349	35,960	37,548	36,061	153	0.1
Last FC	35,123	36,130	32,171	36,052	35,931	37,188	36,712	37,403		
<b>Dry</b>										
Actual	29,831	30,814	33,599	34,143	35,070	36,727	39,152	38,482	27,721	11.1
Last FC	24,055	27,806	26,960	31,012	31,259	34,067	36,265	38,674		
<b>Total</b>										
Actual	67,229	64,867	66,782	71,453	70,419	72,688	76,700	74,543	27,874	5.2
Last FC	59,177	63,936	59,131	67,064	67,191	71,255	72,977	76,076		
<b>Metro Core</b>										
<b>Wet</b>										
Actual	32,295	27,526	27,245	29,359	27,479	28,720	28,345	26,954	17,941	8.5
Last FC	25,880	26,601	23,694	26,306	26,162	27,453	26,981	26,905		
<b>Dry</b>										
Actual	12,450	11,797	13,125	14,555	16,028	15,832	16,601	16,960	540	0.5
Last FC	11,120	13,184	12,661	14,759	15,315	16,096	16,435	17,237		
<b>Total</b>										
Actual	44,745	39,323	40,370	43,914	43,506	44,552	44,946	43,913	18,481	5.7
Last FC	37,000	39,784	36,355	41,066	41,478	43,548	43,416	44,142		
<b>Regional Core</b>										
<b>Wet</b>										
Actual	69,693	61,579	60,428	66,669	62,828	64,680	65,894	63,015	18,094	3.6
Last FC	61,003	62,730	55,865	62,358	62,094	64,641	63,693	64,308		
<b>Dry</b>										
Actual	42,281	42,611	46,724	48,698	51,098	52,559	55,752	55,442	28,261	7.7
Last FC	35,175	40,990	39,621	45,772	46,575	50,163	52,700	55,910		
<b>Total</b>										
Actual	111,974	104,190	107,152	115,368	113,926	117,239	121,646	118,457	46,355	5.4
Last FC	96,177	103,720	95,486	108,130	108,668	114,804	116,393	120,219		

## Calendar Year Forecast

(tons, unless otherwise specified)

	Calendar Year											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Delivery Tonnage</b>												
<b>Private Core</b>												
Wet	405,936	398,193	406,757	415,438	434,227	482,389	487,190	494,063	499,623	504,550	510,222	513,982
Change	2.3	(1.9)	2.2	2.1	4.5	11.1	1.0	1.4	1.1	1.0	1.1	0.7
Dry	273,579	301,333	321,549	356,475	424,043	457,097	463,677	469,876	474,275	477,756	479,823	479,498
Change	7.4	10.1	6.7	10.9	19.0	7.8	1.4	1.3	0.9	0.7	0.4	(0.1)
Total	679,515	699,526	728,306	771,913	858,270	939,486	950,867	963,939	973,898	982,307	990,045	993,480
Change	4.3	2.9	4.1	6.0	11.2	9.5	1.2	1.4	1.0	0.9	0.8	0.3
<b>Metro Core</b>												
Wet	280,278	286,859	304,643	322,088	331,698	294,765	299,591	307,301	313,470	318,894	325,559	329,977
Change	(8.6)	2.3	6.2	5.7	3.0	(11.1)	1.6	2.6	2.0	1.7	2.1	1.4
Dry	123,180	128,421	143,798	163,916	179,240	193,348	196,131	198,753	200,614	202,087	202,961	202,823
Change	(5.8)	4.3	12.0	14.0	9.3	7.9	1.4	1.3	0.9	0.7	0.4	(0.1)
Total	403,458	415,281	448,441	486,003	510,937	488,113	495,722	506,055	514,084	520,981	528,519	532,800
Change	(7.8)	2.9	8.0	8.4	5.1	(4.5)	1.6	2.1	1.6	1.3	1.4	0.8
<b>Regional Core</b>												
Wet	686,214	685,052	711,400	737,526	765,925	777,154	786,781	801,364	813,093	823,444	835,781	843,959
Change	(2.5)	(0.2)	3.8	3.7	3.9	1.5	1.2	1.9	1.5	1.3	1.5	1.0
Dry	396,758	429,755	465,347	520,390	603,283	650,445	659,808	668,630	674,889	679,843	682,784	682,321
Change	2.9	8.3	8.3	11.8	15.9	7.8	1.4	1.3	0.9	0.7	0.4	(0.1)
Total	1,082,972	1,114,807	1,176,747	1,257,917	1,369,208	1,427,598	1,446,589	1,469,994	1,487,982	1,503,287	1,518,565	1,526,280
Change	(0.6)	2.9	5.6	6.9	8.8	4.3	1.3	1.6	1.2	1.0	1.0	0.5

## Fiscal Year Forecast

(tons, unless otherwise specified)

	Fiscal Year											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Delivery Tonnage</b>												
<b>Private Core</b>												
Wet	396,032	404,509	405,945	405,289	425,489	461,244	484,782	490,615	496,834	502,079	507,377	512,096
Change	(1.7)	2.1	0.4	(0.2)	5.0	8.4	5.1	1.2	1.3	1.1	1.1	0.9
Dry	257,415	291,532	314,896	332,276	401,241	440,718	460,353	466,744	472,053	475,998	478,779	479,662
Change	1.5	13.3	8.0	5.5	20.8	9.8	4.5	1.4	1.1	0.8	0.6	0.2
Total	653,447	696,041	720,840	737,565	826,730	901,962	945,135	957,360	968,887	978,076	986,156	991,758
Change	(0.5)	6.5	3.6	2.3	12.1	9.1	4.8	1.3	1.2	0.9	0.8	0.6
<b>Metro Core</b>												
Wet	295,335	275,522	293,713	316,289	336,499	307,733	297,134	303,376	310,330	316,133	322,166	327,727
Change	(7.1)	(6.7)	6.6	7.7	6.4	(8.5)	(3.4)	2.1	2.3	1.9	1.9	1.7
Dry	127,411	122,611	135,075	155,438	172,787	187,879	194,738	197,441	199,683	201,350	202,523	202,892
Change	(6.3)	(3.8)	10.2	15.1	11.2	8.7	3.7	1.4	1.1	0.8	0.6	0.2
Total	422,746	398,133	428,788	471,726	509,286	495,612	491,872	500,817	510,012	517,482	524,689	530,620
Change	(6.8)	(5.8)	7.7	10.0	8.0	(2.7)	(0.8)	1.8	1.8	1.5	1.4	1.1
<b>Regional Core</b>												
Wet	691,367	680,031	699,658	721,578	761,988	768,977	781,916	793,992	807,164	818,211	829,543	839,824
Change	(4.1)	(1.6)	2.9	3.1	5.6	0.9	1.7	1.5	1.7	1.4	1.4	1.2
Dry	384,826	414,143	449,971	487,713	574,028	628,597	655,091	664,185	671,736	677,347	681,302	682,554
Change	(1.2)	7.6	8.7	8.4	17.7	9.5	4.2	1.4	1.1	0.8	0.6	0.2
Total	1,076,194	1,094,174	1,149,628	1,209,291	1,336,016	1,397,574	1,437,007	1,458,177	1,478,899	1,495,559	1,510,845	1,522,378
Change	(3.1)	1.7	5.1	5.2	10.5	4.6	2.8	1.5	1.4	1.1	1.0	0.8

## Forecast Changes

### Current v Previous Forecast

(tons, unless otherwise specified)

	Calendar Year						Fiscal Year					
	2016	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2022
<b>Delivery Tonnage</b>												
<b>Private Core</b>												
Wet	1,038	43,618	44,717	50,256	54,092	57,006	25,572	44,189	47,486	52,179	55,558	58,886
Change	0.2	9.9	10.1	11.3	12.1	12.7	5.9	10.0	10.7	11.7	12.4	13.1
Dry	12,981	51,528	48,560	54,394	49,156	44,483	43,870	50,186	51,452	51,931	46,952	41,752
Change	3.2	12.7	11.7	13.1	11.6	10.3	11.1	12.2	12.4	12.4	10.9	9.6
Total	14,019	95,146	93,277	104,650	103,249	101,490	69,442	94,376	98,938	104,110	102,510	100,638
Change	1.7	11.3	10.9	12.2	11.9	11.5	8.3	11.1	11.5	12.0	11.7	11.4
<b>Metro Core</b>												
Wet	2,233	(46,583)	(67,834)	(70,009)	(75,408)	(83,809)	(21,828)	(57,107)	(68,937)	(72,700)	(79,581)	(87,049)
Change	0.7	(13.6)	(18.5)	(18.6)	(19.4)	(20.8)	(6.6)	(16.1)	(18.5)	(19.0)	(20.1)	(21.3)
Dry	(677)	5,002	3,351	5,804	3,189	875	3,711	4,222	4,578	4,543	2,071	(461)
Change	(0.4)	2.7	1.7	3.0	1.6	0.4	2.0	2.2	2.4	2.3	1.0	(0.2)
Total	1,556	(41,581)	(64,483)	(64,205)	(72,219)	(82,935)	(18,118)	(52,885)	(64,359)	(68,158)	(77,510)	(87,509)
Change	0.3	(7.9)	(11.5)	(11.3)	(12.3)	(13.7)	(3.5)	(9.7)	(11.4)	(11.8)	(13.0)	(14.3)
<b>Regional Core</b>												
Wet	3,271	(2,965)	(23,118)	(19,753)	(21,316)	(26,803)	3,744	(12,918)	(21,451)	(20,521)	(24,023)	(28,163)
Change	0.4	(0.4)	(2.9)	(2.4)	(2.6)	(3.2)	0.5	(1.6)	(2.6)	(2.5)	(2.9)	(3.3)
Dry	12,304	56,530	51,911	60,198	52,346	45,358	47,581	54,408	56,030	56,473	49,023	41,292
Change	2.1	9.5	8.5	9.9	8.4	7.1	8.2	9.1	9.2	9.2	7.8	6.5
Total	15,575	53,565	28,794	40,445	31,030	18,555	51,324	41,491	34,579	35,952	25,000	13,129
Change	1.2	3.9	2.0	2.8	2.1	1.2	3.8	3.0	2.4	2.5	1.7	0.9

## Revenue Tonnage & Other Key Aggregates

### Last Forecast Performance

*(tons, unless otherwise specified)*

	Month/Year								Cumulative Difference	
	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Dec-15 - Jul-16	
									Tons	%
<b>Revenue Tonnage</b>										
Private Core										
Actual	56,079	51,688	53,652	56,765	54,645	58,271	58,330	58,969	5,940	1.3
Last FC	45,696	54,729	50,012	56,315	55,521	58,781	59,526	61,878		
Metro Core										
Actual	44,745	39,323	40,370	43,914	43,506	44,552	44,946	43,913	18,481	5.7
Last FC	37,000	39,784	36,355	41,066	41,478	43,548	43,416	44,142		
Regional Core										
Actual	100,824	91,011	94,023	100,680	98,152	102,823	103,275	102,882	24,421	3.2
Last FC	82,696	94,513	86,367	97,381	96,999	102,329	102,943	106,021		
Solid Waste Fund-related										
Actual	111,893	100,099	104,821	111,888	106,560	110,876	110,758	109,114	33,625	4.0
Last FC	90,766	102,048	93,592	105,640	105,214	110,164	110,902	114,058		
General Fund-related										
Actual	113,166	101,137	105,827	112,959	107,598	111,996	111,972	110,375	34,628	4.1
Last FC	91,732	103,064	94,465	106,631	106,234	111,228	111,919	115,129		
<b>Other Tonnage</b>										
Subject to Reg. Allocation										
Actual	65,180	57,364	56,523	62,045	57,947	60,334	60,805	57,984	15,075	3.3
Last FC	56,893	58,498	52,096	58,135	57,884	60,284	59,392	59,926		
Subject to Disposal Costs										
Actual	74,584	64,192	64,566	71,715	68,000	69,992	71,476	73,306	22,284	4.2
Last FC	62,944	66,498	59,154	67,272	66,920	70,406	69,841	72,512		
Subject to Com. Enhancement Fee										
Actual	85,410	74,541	75,832	83,709	84,683	87,473	88,809	85,181	18,311	2.8
Last FC	75,224	77,200	69,802	80,266	83,671	87,926	86,474	86,764		

## Calendar Year Forecast

(tons, unless otherwise specified)

	Calendar Year											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Revenue Tonnage</b>												
Private Core	527,354	543,379	555,203	586,113	678,193	754,150	762,324	772,322	779,922	786,332	792,639	795,617
Change	3.5	3.0	2.2	5.6	15.7	11.2	1.1	1.3	1.0	0.8	0.8	0.4
Metro Core	403,458	415,281	448,441	486,003	510,937	488,113	495,722	506,055	514,084	520,981	528,519	532,800
Change	(7.8)	2.9	8.0	8.4	5.1	(4.5)	1.6	2.1	1.6	1.3	1.4	0.8
Regional Core	930,812	958,660	1,003,645	1,072,117	1,189,131	1,242,263	1,258,046	1,278,377	1,294,006	1,307,313	1,321,158	1,328,417
Change	(1.7)	3.0	4.7	6.8	10.9	4.5	1.3	1.6	1.2	1.0	1.1	0.5
Total Solid Waste Fund-related	1,019,972	1,049,020	1,093,617	1,179,404	1,291,684	1,342,423	1,359,490	1,380,954	1,397,567	1,411,707	1,426,236	1,434,028
Change	(1.6)	2.8	4.3	7.8	9.5	3.9	1.3	1.6	1.2	1.0	1.0	0.5
Total General Fund-related	1,030,417	1,059,703	1,104,652	1,191,543	1,304,719	1,355,101	1,372,480	1,394,251	1,411,125	1,425,504	1,440,233	1,448,159
Change	(1.5)	2.8	4.2	7.9	9.5	3.9	1.3	1.6	1.2	1.0	1.0	0.6
<b>Other Tonnage</b>												
Subject to Reg. Allocation	641,405	640,556	665,048	687,824	712,195	724,649	732,981	746,291	756,940	766,304	777,809	785,436
Change	(2.7)	(0.1)	3.8	3.4	3.5	1.7	1.1	1.8	1.4	1.2	1.5	1.0
Subject to Disposal Costs	681,926	696,880	735,947	787,569	848,051	858,409	868,992	883,726	851,990	861,406	871,864	877,978
Change	(5.0)	2.2	5.6	7.0	7.7	1.2	1.2	1.7	(3.6)	1.1	1.2	0.7
Subject to Com. Enhancement Fee	619,901	615,296	649,450	822,016	993,972	997,074	998,631	1,019,429	1,036,644	1,052,106	1,064,603	1,072,002
Change	4.9	(0.7)	5.6	26.6	20.9	0.3	0.2	2.1	1.7	1.5	1.2	0.7

(shaded values are forecasts)

## Fiscal Year Forecast

(tons, unless otherwise specified)

	Fiscal Year											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Revenue Tonnage</b>												
Private Core	505,598	541,108	555,480	556,232	641,964	721,304	758,230	767,315	776,116	783,122	789,480	794,125
Change	(2.4)	7.0	2.7	0.1	15.4	12.4	5.1	1.2	1.1	0.9	0.8	0.6
Metro Core	422,746	398,133	428,788	471,726	509,286	495,612	491,872	500,817	510,012	517,482	524,689	530,620
Change	(6.8)	(5.8)	7.7	10.0	8.0	(2.7)	(0.8)	1.8	1.8	1.5	1.4	1.1
Regional Core	928,344	939,242	984,268	1,027,958	1,151,251	1,216,916	1,250,103	1,268,132	1,286,128	1,300,604	1,314,169	1,324,745
Change	(4.5)	1.2	4.8	4.4	12.0	5.7	2.7	1.4	1.4	1.1	1.0	0.8
Total Solid Waste Fund-related	1,012,102	1,034,119	1,069,271	1,123,672	1,264,990	1,314,732	1,350,908	1,370,145	1,389,200	1,404,584	1,418,907	1,430,091
Change	(5.6)	2.2	3.4	5.1	12.6	3.9	2.8	1.4	1.4	1.1	1.0	0.8
Total General Fund-related	1,022,085	1,044,612	1,080,268	1,135,124	1,277,964	1,327,389	1,363,736	1,383,283	1,402,623	1,418,257	1,432,800	1,444,152
Change	(5.6)	2.2	3.4	5.1	12.6	3.9	2.7	1.4	1.4	1.1	1.0	0.8
<b>Other Tonnage</b>												
Subject to Reg. Allocation	646,876	635,562	654,343	673,812	708,685	716,707	728,770	739,565	751,558	761,572	771,995	781,581
Change	(4.0)	(1.7)	3.0	3.0	5.2	1.1	1.7	1.5	1.6	1.3	1.4	1.2
Subject to Disposal Costs	701,723	688,578	706,700	760,626	831,250	852,455	863,556	876,156	869,031	856,576	866,499	874,841
Change	(3.8)	(1.9)	2.6	7.6	9.3	2.6	1.3	1.5	(0.8)	(1.4)	1.2	1.0
Subject to Com. Enhancement Fee	615,695	605,798	629,224	674,117	982,944	994,509	997,675	1,008,901	1,027,921	1,044,266	1,058,299	1,068,266
Change	4.2	(1.6)	3.9	7.1	45.8	1.2	0.3	1.1	1.9	1.6	1.3	0.9

(shaded values are forecasts)

## Forecast Changes

### Current v Previous Forecast

(tons, unless otherwise specified)

	Calendar Year						Fiscal Year					
	2016	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2022
<b>Revenue Tonnage</b>												
Private Core	(3,483)	53,630	52,712	61,853	61,155	60,299	31,065	53,273	57,284	61,596	60,808	60,054
Change	(0.5)	7.7	7.4	8.7	8.5	8.3	4.5	7.6	8.1	8.6	8.4	8.2
Metro Core	1,556	(41,581)	(64,483)	(64,205)	(72,219)	(82,935)	(18,118)	(52,885)	(64,359)	(68,158)	(77,510)	(87,509)
Change	0.3	(7.9)	(11.5)	(11.3)	(12.3)	(13.7)	(3.5)	(9.7)	(11.4)	(11.8)	(13.0)	(14.3)
Regional Core	(1,927)	12,049	(11,771)	(2,353)	(11,064)	(22,636)	12,947	388	(7,074)	(6,561)	(16,702)	(27,455)
Change	(0.2)	1.0	(0.9)	(0.2)	(0.8)	(1.7)	1.1	0.0	(0.6)	(0.5)	(1.3)	(2.0)
Total Solid Waste Fund-related	920	17,545	(5,956)	3,832	(4,461)	(15,563)	18,483	6,043	(1,074)	(167)	(9,863)	(20,121)
Change	0.1	1.3	(0.4)	0.3	(0.3)	(1.1)	1.4	0.4	(0.1)	(0.0)	(0.7)	(1.4)
Total General Fund-related	1,047	17,575	(6,096)	3,817	(4,430)	(15,551)	18,525	5,987	(1,155)	(161)	(9,843)	(20,132)
Change	0.1	1.3	(0.4)	0.3	(0.3)	(1.1)	1.4	0.4	(0.1)	(0.0)	(0.7)	(1.4)
<b>Other Tonnage</b>												
Subject to Reg. Allocation	3,155	(2,653)	(22,085)	(19,234)	(20,977)	(26,379)	4,016	(12,255)	(20,671)	(20,092)	(23,644)	(27,644)
Change	0.4	(0.4)	(2.9)	(2.5)	(2.7)	(3.3)	0.6	(1.7)	(2.7)	(2.6)	(3.0)	(3.5)
Total Subject to Disposal Costs	15,315	4,144	(16,515)	(11,588)	(59,732)	(68,417)	13,776	(6,056)	(14,175)	(34,337)	(64,034)	(71,895)
Change	1.8	0.5	(1.9)	(1.3)	(6.6)	(7.4)	1.6	(0.7)	(1.6)	(3.8)	(7.0)	(7.7)
Subject to Com. Enhancement Fee	5,281	(20,472)	(55,481)	(51,291)	(56,706)	(60,232)	(2,692)	(37,901)	(53,405)	(53,949)	(58,464)	(63,008)
Change	0.5	(2.0)	(5.3)	(4.8)	(5.2)	(5.4)	(0.3)	(3.7)	(5.0)	(5.0)	(5.3)	(5.6)