

DATE: June 29, 2021

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CC: Dayna Webb, PE, Oregon City

FROM: Wes Wegner, PE, Wallis Engineering

RE: Water, Sanitary Sewer, and Stormwater System Implications of HB2001

## PROJECT PURPOSE AND INTRODUCTION

The purpose of this memorandum is to determine the impact of increased housing density within certain residential zones on the water supply and distribution system, the sanitary sewer collection system, and the stormwater system. Wastewater treatment is provided by the Tri-City Sewer District and potable water supply is provided by the South Fork Water Board; both of which are not assessed in this memorandum.

## EXECUTIVE SUMMARY

House Bill 2001 (HB2001) addresses the shortage of Division 46 Middle Housing in Medium and Large Cities. As a large city, Oregon City is required to meet the new standards set forth in the 2019 law. The additional middle housing units include duplexes, triplexes, townhouses, and cottage clusters – these types of units allow for multiple dwellings on a single Lot or Parcel. These housing types already exist within City limits, but frequently have not been allowed in many neighborhoods. The code amendments set forth to meet the requirements of HB2001 mandate that middle housing be allowed in both existing and proposed developments in low- and medium-density residential zones.

HB2001 requires Oregon City to provide “sufficient infrastructure” to meet demand increases related to allowing middle housing in residential zones. This memorandum provides an assessment of the water, sanitary sewer, and stormwater infrastructure implications of the code amendments contained in HB2001. HB2001 guidance projects a planning level infill growth of 3% and greenfield growth of 3%. The analysis in this memorandum is based on that growth rate. The City does not meet the threshold to request an Infrastructure-Based Time Extension by June 30, 2021 using the growth rate dictated in HB2001 to analyze the adequacy of infrastructure.

This memorandum identifies specific infrastructure components in the water supply and distribution, sanitary sewer collection, and stormwater conveyance systems that will likely be impacted by density increases driven by HB2001. A summary of the infrastructure impacts is described below:

- HB 2001 is not anticipated to impact water distribution pipe sizing, as fire flow capacity is not expected to change. However, the estimated 3% demand increase across low- and medium-density residential zones will create additional storage needs, particularly in the Upper Zone. The City has also identified an existing transmission deficiency between the Henrici Reservoir and the Mountainview pump station that may need to be expedited based on potential HB 2001 demand increases.
- System wide, HB 2001 is not expected to significantly impact the sanitary sewer system because the majority of peak flow is due to infiltration and inflow. However, existing components with

limited capacity, including the Parish Road Pump Station and the Settler's Point Pump Station, should be monitored. If growth is significantly greater than the assumptions in the previous master plans, additional capacity and improvements may be needed sooner than expected.

- Additional greenfield development is not expected to impact the City's stormwater system, because development will likely be greater than the threshold for onsite stormwater management requirements. Infill growth may result in increased stormwater flow if impervious surfaces are less than the onsite stormwater management threshold, and these will need to be assessed on an individual basis. However, infill represents significantly less potential development than greenfield throughout the UGB and is not anticipated to substantially increase stormwater runoff collected by the City's stormwater conveyance system.

Timelines and design criteria for Capital Improvement Projects should be reconsidered as the actual, and not assumed, impacts of HB 2001 are understood with greater reliability. No immediate deviation from current master planning recommendations is warranted as the growth rates assumed in the respective Master Plans are still assumed to be reasonably valid. It is also relevant to note that the Master Planning growth assumptions over the planning period account for significantly more growth within the Urban Growth Boundary than the HB 2001 changes will represent in the near term.

The projected 3% growth increase used to analyze the infrastructure components for this memorandum is not based on historical data, as would normally be the case for master planning level efforts. Growth rates are assumed for this analysis and there remains a high level of uncertainty regarding the actual growth impacts. Basing the need for capital improvements and expenditure on unreliable or unconfirmed data would potentially raise additional concerns and questions regarding the validity of the infrastructure master plans. Therefore, it is recommended that the City actively monitor growth and metric changes as a result of HB 2001 to determine if the assumptions made in the various infrastructure Master Plans and this memorandum are significantly flawed. The collected long-term data should be analyzed at a recommended minimum frequency of once per year. If the analyzed growth metrics resulting from HB 2001 show a significant variance from the master planning assumptions, a re-evaluation of master planning documents should be considered but not until such time that confirmed growth data can be evaluated.

As HB 2001 will allow a large spectrum of dwelling unit options within future developments, the City should also pursue procedures, as part of the HB code amendment process, to evaluate a minimum amount of missing middle housing dwelling units in any infrastructure analysis completed during the land use review process. Larger missing -middle development proposals should be analyzed for project-specific compliance.

## PLANNING ASSUMPTIONS

For the purposes of the memorandum, low- and medium-density residential zones will refer to R-10, R-8, R-6, R-5, and R-3.5 zones as described in the most recent update of the City's Zoning Ordinance. Growth in these zones is anticipated to occur at a 3% density increase for infill growth and a 3% density increase for greenfield development based on a growth estimates set forth by HB 2001 guidance. Greenfield development assumptions include the three designated concept areas: Park Place, Thimble Creek, and South End.

The specific requirements of HB 2001 dictate that the City must provide "sufficient infrastructure" for this additional development. "Sufficient infrastructure" is defined as:

- Connection to a public sewer system capable of meeting established service levels.

- Connection to a public water system capable of meeting established service levels.
- Access via public or private streets meeting adopted emergency vehicle access standards to a city's public street system.
- Storm drainage facilities capable of meeting established service levels for storm drainage.

This memo analyzes the City-owned water system, sanitary sewer collection system, and stormwater system to determine if they represent "sufficient infrastructure" to meet the requirements of HB 2001.

## **WATER DISTRIBUTION SYSTEM**

Analysis of the water storage and distribution system is based on the *2012 Water Distribution System Master Plan (WDSMP)* prepared by West Yost Associates and the *2020 Amendment* prepared by MurraySmith.

The storage requirements set forth in these planning documents are as follows (*WDSMP Table 4-1*):

- Equalization – 25% of the maximum daily demand (MDD) for the given storage or pressure zone
- Emergency – 100% of the MDD for the given storage or pressure zone
- Fire flow – based on the specific use within the given storage or pressure zone
- A combination of these three components dictates the total storage required in each storage or pressure zone

### **Fire Flow**

Capacity of the water system to accommodate future growth within the City is in large part controlled by its ability to provide adequate fire volumetric storage and fire flow to all developable areas. The fire flow requirements identified in the 2012 WDSMP for residential units are as follows: single family residential units require a sustained fire flow of 1,500 gallons per minute for two hours, while multi-family residential units require a sustained fire flow of 1,500 gallons per minute for three hours. All water service zones within the City provide, at a minimum, capacity to achieve fire flow for multi-family units. As such, the changes proposed as part of HB 2001 do not affect the required fire flow to any water zones defined in the WDSMP.

Fire flow requirements are also the dictating criteria for pipe sizing in the water distribution network, because the maximum daily demand associated with residential use is considerably less than the required fire flow capacity. Furthermore, the maximum daily demand increase associated with HB 2001 and summarized below is an even smaller proportion of the total flow capacity required for adequate fire flow. Thus, impacts to pipe sizing as evaluated in the WDSMP for future growth are not anticipated to be impacted by the additional development contemplated by HB 2001.

### **Maximum Daily Demand**

The remaining storage requirements are dictated by the maximum daily demand within a storage or pressure zone. These values will be affected by a density increase within existing and proposed residential areas. There are currently approximately 8,850 existing residential meters within the existing low- and medium-density residential zones. An infill growth of 3% would lead to an additional 266 meters. Assuming each meter represents an equivalent dwelling unit (EDU), the infill growth results in an additional 266 EDUs.

Greenfield development will mainly occur along the outskirts of the City but within the UGB. However, there are unconstrained vacant lands throughout the City's established low- and medium density

residential zones that could potentially see development. In total, 2,396 of a total of 3,990 acres zoned for low- and medium-density residential housing have been developed as of 2008, as per the 2012 WDSMP (WDSMP Table 3-11, Table 3-14). If the remaining 1,594 acres are developed, an additional 5,508 EDUs would be created based on the normalized unit demand factor of 1050 gallons per acre per day established in the 2012 WDSMP (Table 3-12) and the 287 gallons per day per EDU established in the 2020 Amendment (Demand Summary p. 6). A 3% density increase in this greenfield development category would lead to 175 EDUs of estimated greenfield growth beyond the current WDSMP's assumptions.

In addition to infill growth and greenfield development within the UGB, growth will also occur in the three designated concept areas: Park Place, South End, and Thimble Creek. The concept areas have established estimates for total low- and medium-density development. These totals, based on the concept area planning documents, are as follows: 1,041 EDUs for Park Place, 2,299 EDUs for South End, and 1,023 EDUs for Thimble Creek. A 3% density increase across these three concept areas will result in 131 additional EDUs.

The density increases for infill development, greenfield development within the UGB, and concept area development is estimated to result in an additional 572 EDUs. This will result in a MDD increase of 0.38 million gallons per day (mgd). To meet storage requirements, 125% (equalization and emergency storage) of the MDD must be provided through either storage or pump capacity. The additional storage required to meet HB 2001-related density increases throughout the UGB is 0.48 million gallons (MG).

## **Impacts to Water Distribution System**

As discussed above, there are not expected to be any impacts to the water distribution piping system, as pipe sizing is primarily dictated by fire flow requirements. However, there may be impacts to the water storage and transmission infrastructure.

The City is currently assessing options to address storage deficiencies in the Upper pressure zone. The 2020 WDSMP Amendment projects a 2040 storage deficiency of 6.5 million gallons across the Henrici and Boynton reservoirs (2020 WDSMP Amendment, Table 6). A new 250-gallon-per-minute pump station and 1.75-million-gallon reservoir near the Fairway Downs area (2020 WDSMP Amendment, Table 17) are intended to relieve some of this storage deficiency and serve future development in the Fairway Downs and Thimble Creek areas. The Upper pressure zone contains a large proportion of low- to medium-density residential zoning and thus might make up a disproportionate amount of the added demand from increased density. Therefore, storage projections may need to be re-evaluated to account for additional growth to HB 2001. If the proportion of growth within the Upper zone remains the same as existing, the density increase will result in an additional MDD of 0.29 mgd. This would result in an additional 0.36 MG of storage required. As the City experiences growth throughout the Upper zone, the design capacity of the new pump station and reservoir will need to be re-examined and confirmed prior to implementing the recommended improvements.

During peak summer demand, the City also experiences challenges keeping the Henrici reservoir filled and the Boynton standpipe from overflowing. Attempts to maintain reservoir levels by increasing flow from the Mountainview pump station have caused high pressure complaints from the customer base near the pump station. Construction of the Mountainview to Henrici transmission line currently in the Capital Plan (2020 WDSMP Amendment, Appendix F) will provide supply resiliency and will allow the City to utilize existing assets more effectively while addressing pressure issues experienced by customers. The first phase of this new transmission line is under construction as part of the Molalla Avenue project. However, the desired resiliency will not be experienced until the additional phases of the project are completed. The timeline for implementation of the remaining sections and completion of the full transmission line should continue to be prioritized to provide relief from summer season demand issues.

The need for this capital improvement will increase in importance if HB 2001 results in additional growth and density as projected.

## **SANITARY SEWER COLLECTION SYSTEM**

Analysis of the sanitary sewer collection system is based on the *2014 Sanitary Sewer Master Plan* (SSMP) prepared by Brown and Caldwell. The SSMP relies on a hydraulic model developed by Brown and Caldwell, which was used to model the sanitary sewer system during a 10-year, 24-hour storm event.

### **Peak Flow Analysis**

Without augmentation of the hydraulic model, it is not possible to make an analytical assessment of the impact of the HB 2001-related density increases. For two reasons, it is not currently recommended that the City re-model the system. As mentioned previously, the 3% growth projection is an assumed growth estimate and is not based on collected data. The additional expenditure to remodel the system based on assumed growth data does not seem warranted. Secondly, an order-of-magnitude estimate can be made using available data, and the result shows very little impact to the collection system. The order-of-magnitude estimate can be made by assuming the same increase in EDUs as established in the water distribution system analysis described above. The SSMP established residential base flow rate of 80 gallons per capita per day and assumed 2.5 residents per EDU (SSMP, *Table 3-2*). With an additional 572 EDUs, the base flow will increase 0.1 million gallons per day (mgd) beyond the SSMP projections. The SSMP measured a base flow rate of 4.99 million gallons per day (mgd) within the existing system (SSMP, *Table D-1*). This measurement is now outdated, and current and future base flow rates are assumed to be higher. The increase in density due to HB 2001 only represents an increase in the existing, 2008-measured base flow rate of 2%. This will represent an even smaller component of future base flow rates, which are not summarized in the SSMP.

However, sewer collection systems are designed to convey peak wet weather flow rates, which are significantly greater than base flows due to the impact of infiltration and inflow. The SSMP modeled the sewer collection system under peak wet weather conditions during a 10-year, 24-hour storm. The peak flow rates are projected to be 37.6 million gallons per day (mgd) (SSMP, *Appendix E-1*). The additional EDUs are not expected to add any additional infiltration and inflow. The increase in peak flow rates is therefore expected to be equal to the additional base flow, plus a peaking factor to account for diurnal flow variations. Assuming a peaking factor of 1.5 (typical value for similar cities), the additional EDUs will increase the peak flow by an estimated maximum of 0.15 million gallons per day (mgd). This is an increase of approximately 0.4%.

### **Pump Station Capacity**

The SSMP identifies two pump stations that have existing or future capacity concerns: the Parrish Road PS and the Settler's Point PS (SSMP *Appendix B*). The Parrish Road PS has sufficient capacity for current flows but is anticipated to receive significant future flow from the South End Concept Area. The South End Concept Area has a higher chance to be impacted by HB 2001 than similar proposed developments due to the quantity of projected greenfield development into medium- to low-density housing. Density increases beyond the concept plan proposal and throughout the basin should be monitored by City to determine the need and timing for capacity upgrades to the pump station.

The Settler's Point PS experiences high peaking factors that warrant additional scrutiny. Suspected high levels of I/I inflow from the contributing basin cause flow rates to reach the existing pump station capacity, and projected future flows will further exceed the capacity. A planned I/I project to address these peaking factors has been included in the SSMP. Until the I/I issues are addressed, any density

increases that contribute flow to the basin should be monitored by the City and included in the annual report of middle housing projects. Additional development in the basin could push the pump station beyond its wet weather capacity. A capacity increase for the pump station may be warranted if I/I abatement projects are unable to keep up with the additional demand should significant development occur.

### **Impacts to Sanitary Sewer System**

System wide, the increase in density due to HB 2001 is not expected to have a significant adverse impact on the sanitary sewer collection system. Base flows are not expected to increase substantially, and peak flows are impacted primarily by infiltration and inflow. The small increases in base flow and peak flow are not likely to change any conclusions of the *SSMP* regarding sewer and pump station sizing. However, on a neighborhood basis, it is possible that certain sewers will need to be upsized if growth occurs faster than assumed in the *SSMP*, and the pump stations discussed above should be monitored closely. It is recommended to revisit planning level assumptions as part of the next sanitary sewer master plan update.

It is also possible that density increases reduce the total I/I levels in the system. Home laterals are a common source of I/I, especially as they age. The infill and greenfield development associated with HB 2001 may create opportunities to repair or replace home service laterals that would not otherwise be addressed during I/I reduction projects. While this impact may amount to a negligible reduction, the new service laterals will, at the very least, not contribute additional I/I.

## **STORMWATER SYSTEM**

All new development and redevelopment that results in 5,000 square feet of new or replaced impervious surface is required to meet the City's *2015 Stormwater Grading and Design Standards* (Standards). This threshold will apply to all greenfield development and infill development with significant impervious surface creation. Developments above the threshold will trigger the following design criteria (*Oregon City Stormwater Grading and Design Standards Chapter 4*):

- Flow Control Requirements: the post-development flows must match predevelopment peak flows between 42% of the 2-year peak flow rate up to the 10-year peak flow rate. For the purposes of this requirement, the predevelopment condition refers to the historical vegetation which existed at the site prior to urban settlement.
- General Conveyance Requirement: development within a lot or parcel shall not cause flooding of adjacent or downstream properties. Developments for which this standard applies must implement surface infiltration facilities for collected runoff according to the LID requirement.
- LID Requirement: The goal is to prioritize the use of surface infiltration facilities to the maximum extent practicable to mimic the natural stormwater runoff conditions of the pre-developed site and recharge the groundwater. This should be done with surface infiltration to the maximum extent practicable, or onsite retention and infiltration where surface infiltration options are insufficient.

Stormwater and grading design standards are applied to each development as part of the City's development process and the responsibility for compliance falls on the developer including constructing the infrastructure necessary to meet the Standards. It is important to note that greenfield development affected by HB 2001 will likely surpass impervious surface thresholds and will therefore require the developer to mitigate runoff impacts. Additionally, because much of the greenfield area in the City is no longer forested and likely already contributes flow to the City's stormwater system, the flow control

requirement applied to new developments will result in a net decrease in runoff entering the City's stormwater infrastructure up to the design storm.

Developments with small increases to impervious surfaces (less than 5,000 square feet), including infill driven by the code changes allowed by HB 2001, are only required to provide erosion prevention and sediment control (*Oregon City Stormwater Grading and Design Standards Chapter 1*). Any infill development will likely contribute flow to the City's stormwater infrastructure. However, as mentioned in the water distribution system analysis, infill represents significantly less potential development than greenfield throughout the UGB and is not anticipated to substantially increase stormwater runoff collected by the City's stormwater conveyance system. Thus, density increases allowed by the code changes will not adversely impact the City's stormwater system as they will be assessed individually based on development proposals.

## CONCLUSIONS

The assumptions used to analyze the existing water, sewer, and stormwater systems are based on the long-term planning documents developed over the last decade(s) by the City and various consultant engineering firms. These documents provide a roadmap for growth, development, and capital improvement projects that relies on sound engineering judgment, historical trends, hydraulic modeling, and growth assumptions. While the documents provide an adequate illustration of a hypothetical future for Oregon City, the realities of growth and development are challenging to predict. As a point of fact, the 3% infill development and 3% greenfield development used to estimate the HB 2001-related density increases are conservative estimates chosen to provide an adequate margin for growth under the new code changes. The projections included in this memo may prove to be conservative and the actual impacts of higher-density development could vary significantly from those assessed. The greenfield development that will occur in the various concept areas and throughout the UGB represent a much more significant impact to the City's existing infrastructure than missing middle housing development can realistically generate. However, this memo should serve as an opportunity to revisit the assumptions and trends that drove development of the WDSMP/Amendment and SSMP. To reiterate, unlike master plans, the growth estimates in the memorandum are not based on any historical trends. It is recommended that the City of Oregon City monitor the impacts of missing middle housing development on a yearly basis in order to determine if any master planning assumptions warrant re-evaluation. As development and growth occurs, or fails to occur, over the next few years, the City should revisit the schedule and scope of capital improvement projects to meet demand in areas with known or predicted insufficiencies. The most critical areas are:

- Water: Capacities of the new 250-gallon-per-minute pump station and 1.75-million-gallon reservoir near the Fairway Downs area should be re-examined to meet additional demand allowed by the code amendments. Additionally, transmission waterline improvements in the Upper Zone should be prioritized and the timeline for the various phases of the project may need be re-examined to provide supply resiliency in the Upper Zone as demand increases.
- Sewer: Continuation of I/I reduction programs, particularly in the South Zone. Capacity concerns at the Parrish Road pump station and Settler's Point pump station may warrant capacity increases. Re-assess timeline of capital improvement projects for sewer upsizing as demand increases within the various basins.

These conclusions are also applicable to water and sanitary sewer system implications of the code amendments as proposed in support of the Equitable Housing project that were assessed in the 2018 memo prepared by Wallis Engineering, titled "Water and Sanitary Sewer System Implications of

Proposed Code Amendments for Equitable Housing”. The code amendments included in this project encourage increased housing densities and lead to a projected 160 additional EDUs. The increased densities encouraged by this project will additionally augment the need to re-evaluate and reprioritize capital improvement projects based on development growth.

If the City maintains its commitment to the improvement schedules described in the *WDSMP/Amendment* and *SSMP* while responding dynamically to the challenges described in this memo, the City will be able to provide “sufficient infrastructure” to meet demand increases related to increased housing density.

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