Public Process in Utility Master Planning

A Case Study of the City of Bend Collection System Master Planning

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Capstone
Abstract

Utility master planning is the process that is used to determine all the future investments needed in a utility that will provide for new growth as well as address deficient and aging infrastructure. This process is traditionally an engineering intensive effort and most common for water and sewer systems for municipalities, which is the focus of this case study. The approach in this study moves from an engineering centric effort to one that is public involvement centric with the use of advanced modeling technology. The result in this case study shifted public debate around the issue of infrastructure investment from a hyper focus on cost and need, to a focus on policy and finance. While this shift may appear subtle, the results were not. The end result in this case study was public support for needed investments. This paper provides a single case study on using public process in utility master planning focused on a sewer collection system planning. This case study provides an indication of beneficial results that could have much larger implications in how utilities are planned and supported in the future.
Introduction

Foundation of Utility Master Planning and Public Involvement

To better understand public involvement, or the lack thereof, in utility master planning it is helpful to have a brief understanding of the history of utility master planning. Utility master planning evolved from the earliest planning of ancient civilizations. While the earliest known planning documents focused on layouts of structures relative to city centers and military defense (Smith p. 3), these early documents and cases did not include layouts for dealing with water; drinking or waste water. When reviewing these historical planning documents it is apparent that dealing with water and waste water was really an afterthought to the layouts of structures and streets and is documented almost as a coincidence in research documents (Gomis p. 33). The earliest known planning dealing with water infrastructure was in Greece during Minoan Civilization in 3500 BC. This early planning was a technical approach to serving cities by gravity, and also dealt with sewer conveyance away from city centers (Koutsoyiannis, p. 45). When reviewing these historical documents it is interesting to see that there was great thought and debate about the layouts of streets and structures. Yet there is no record of discussion about dealing with water or waste water, and those issues were left to be solved by technicians of the time. The oldest known written information about planning for water infrastructure was by Sextus Julius Frontinus who is known as the first water engineer in Rome (Thayer pg 1). Frontinus stated “No greater care is required upon any works than upon such as are to withstand the action of water; for this reason, all parts of the work need to be done exactly according to the rules of the art” (Robinson p. 392). This technical approach to planning continued and became
better documented over time, but was clearly secondary to the layout and planning for political and military reasons (Chías p. 178).

The point of this history and its evolution of water infrastructure planning is that it established a trend of technical focus that political or other leaders did not engage in. Water utility infrastructure established itself as something that only the skilled and knowledgeable could plan for. Remarkably this trend continues today (Elmer pg. 649).

This trend of little to no public engagement on these issues has some significant implications on societies. This is best summarized by Hadley Arnold, the Executive Director, Arid Lands Institute at Woodbury University in a short essay he wrote for a water exhibit; Hydro-Logic. Arnold identifies the technical experts as water managers of big water that has disassociated people from their everyday understanding of how critical these water systems are. These systems are out of public sight and have been out of the public sight for so long that a vast majority of people in urban centers no longer have any connection to the single most important resource that is the very basis of life itself. Arnold says these technical experts have been doing this for so long that our dependency on both the delivery and removal of water in our daily lives is taken for granted with no understanding of what is involved to do so, or the costs involved (Pamphlet from Exhibit, Colorado Springs, Colorado College Fall 2015).

The lack of public involvement would not be problematic if the public was still unquestioning of the need for the investment, or reinvestment, of these systems and were still willing to pay without question. However that is not the case according to American Water Works Association (AWWA M1 pg. 4). These water systems are failing across the country according to the American Society of Civil Engineers (ASCE). Both water and sewer were given a grade of D in 2013, the last time ASCE did a national report card on these systems. According
May 28, 2016
Tom Hickmann

to ASCE there is a need to invest $3.6 trillion in each water and waste water systems by the year 2020 (ASCE Website). Yet despite this need, the public has resisted any level of significant reinvestment in these systems, which the AWWA identifies as a lack of political will (AWWA M1 pg. 4). According to AWWA the lack of political will comes from the public backlash the elected officials receive when they go to increase rates or revenues to pay for these systems. This same statement was made by some City of Bend City Council members in private conversations. In similar private conversations the same statements have been made by elected officials of other water providers in Oregon. Despite many years of effort from organizations like ASCE and AWWA identifying this problem, the lack of funding continues on both a local level and national level. John Oliver on his HBO series Last Week Tonight interviewed local, state, and federal legislators on the issue of infrastructure. The elected officials made the statement that the issue of public infrastructure, and investment in it, is not “sexy”, which results in lack of will to fund these systems. This lack of public support generates frustration and angst over those who are expected to keep these systems functioning and in compliance with federal regulations.

Without engaging the public in the planning efforts, industry experts are left to essentially “slug it out” for every project identified in any plan. The focus of this paper was to see if pulling the public into the planning process rather than the case by case project approach could yield greater public support.

Question in Thesis to be Answered

If we have a good understanding that the public has not been part of the planning for these utility systems historically, it should not be a surprise that they don’t want to pay for them. From the public perspective these systems have always existed and will continue to do so. The public has no historical context of these systems, how they came to be, how they function, the
cost and complexity of their operation, or why there is a need to reinvest in them. Without this context it is difficult to generate support from the public to ask them to pay more for them (Elmer pg. 5).

If it would be possible to pull the public into the planning process, rather than the project by project approach for these systems, it may be possible to create support to pay for the needed investments. Unfortunately there is little to no published data available specific to utility master planning involving the public, and as stated prior, there is little to no historical context for public process in utility master planning. As a result of this lack of information it makes it difficult for those in the industry to justify a change in their planning to incorporate the public if there is little to no evidence that this effort bears fruit (Interviews with Industry Experts).

There is a demand to answer this question within the industry. Based on many interviews and discussions I have had with industry experts, utility managers, and elected officials that oversee these utilities, they are resistant to creating a public process around utility master planning. However, despite the resistance, there is more interest in the subject of how it would be done. In an interview with Dr. Vicki Elmer, author of Infrastructure Planning and Finance: A Smart and Sustainable Guide, she stated that this was an issue she considered in her book. She also stated she could not find a single case where it had been done. In her book she does suggest that the public should be involved in these planning efforts to create better buy in on infrastructure investment (Elmer pg. 18). She specifically suggests the use of new technologies to help with the public process (Elmer pg. 648).

Process Used to Answer Question of Thesis

For purposes of this paper an attempt was made to access survey data from both AWWA and the American Public Works Association (APWA) to see if prior surveys addressed this issue.
Based on conversations with staff at both of these institutions they were unaware if any of their surveys ever asked any questions regarding utility master planning, much less public involvement. They were also unwilling to provide their surveys to verify if there was any meaningful information that could be gleaned. In addition to the efforts to collect survey data from AWWA and APWA, I authored an article in the APWA Reporter soliciting participation in my own survey on the issue of public involvement in utility master planning (Hickmann pg. 58). Despite the journal having a distribution of more than 30,000 subscribers in both the US and Canada, I only received six responses to participate. This is simply not sufficient to create a statistically valid survey from which any information could be gleaned. I believe the only way to collect sufficient data from utilities would require a very manually intensive effort to get responses. This is not something I could do with limited resources for purposes of this paper.

There is plenty of information and data that shows public process generates support, if done correctly (Bleiker Intro pg. 5). In fact the EPA has provided workshops on public process in urban systems planning using a handbook titled Citizen Participation Handbook for Public Officials and Other Professionals Serving the Public authored by Hans and Annemarie Bleiker. This handbook does a good job at describing an approach to public involvement trying to reach informed consent; meaning a willingness to go along with a project even if they disagree. The approach is focused on dealing with, and implementing, controversial projects. While this material does not specifically address utility master planning, which is very different than implementing an individual project, it was a method that was used within our master planning approach to the extent it could be used. The master plan is a project unto itself and within it can contain dozens to hundreds of individual projects depending on the system being planned. So there was some difficulty in using the approach suggested in the handbook since the issues are
May 28, 2016
Tom Hickmann

much greater, and much more complex than addressing the single project approach. In other
words in this case study we had many hundreds of projects and it was not practical to get
informed consent on each one. We did use the Bleiker approach on parameters used within the
master planning. Part of this case study is to see if that method translated to support for all of the
individual projects.

It would be easy to conclude that involving the public in utility master planning would
yield public support (Bleiker Chpt 5 pg. 1). However this not always the case and what works in
some areas does not necessarily transfer to successful outcomes in other areas (Roberts, pg. 441).
If public involvement is done correctly, meaning using the correct method and tools, there is a
great deal of evidence that public process on projects has had beneficial results (Bleiker Intro pg.
5). However, utility master planning is a bit unique as described prior addressing multiple
projects simultaneously and applying the same general rules for public engagement on the issue
may not be appropriate (i.e. nuanced regulatory compliance, public health risks that are difficult
to understand or quantify, and requires an in-depth understanding of system hydraulics). The
question becomes one of how to involve the public, and not why, so these unique factors can be
comfortably addressed in a public process.

The only case that could be found that involved the public in a meaningful way in utility
master planning was the City of Bend. This paper focuses on that case study. This paper looks at
what laws and process drive utility master planning, why the City decided to use a public
process, how the City of Bend did it, what the results were, and what conclusions if any could be
drawn from the process used. Most importantly does this case study indicate using a similar
process in other utility master planning generate a positive result of public support.
Profession Guidelines

The AWWA is the premier professional body who sets the standards for water and sewer infrastructure and utility systems, including planning. They develop manuals, papers, and other documents to guide professionals in the industry. It is very telling that the most current document AWWA has for master planning for utilities is from the fall of 1965 written as a presentation by Donald Proudfit that was published in an AWWA journal in 1966. They have many other papers that identify case studies of master planning, including one that I was coauthor of titled Pipe Study, Optimization Analysis to Reduce Costs and Improve Operations (Hickmann pg. 24). This is simply covering one element of master planning, and not the subject as a whole. The other manual from AWWA that is often used as a guiding document is the M1 Principles of Water Rates, Fees and Charges, 6th Edition. This manual does not directly address utility master planning, rather it identifies elements of information that are needed to develop defensible rates and revenues. These elements are often used as the minimum requirements in master planning documents.

The Proudfit paper does provide the purpose of a utility master plan in good general terms. Proudfit identifies three major components; deal with growth potential, plan for emergencies, and provide a financial analysis to support rates to pay for infrastructure needs. In the most general sense, this is accurate for what the purpose of a utility master plan is. But this also leaves a lot of flexibility in how to achieve this. It should also be noted that none of the AWWA documents regarding utility master planning address public involvement.

The only other professional source that could be found was a textbook titled Comprehensive Water Distribution Systems Analysis Handbook published by a major
international engineering firm, MWH. The book has a single chapter, Chapter 7, dedicated to master planning. This chapter is indeed comprehensive in technical terms of what it takes to correctly do a utility master plan. What is interesting is on page 7-1 they have a table identifying the reasons to do a utility master plan to address growth, efficiency, and responsible financial spending of public dollars. What it does not show anywhere in the chapter is any discussion of involving the public. In fact to the contrary, the entire chapter is dedicated to the nuanced complexities involved requiring expert analysis and oversite.

**Government Guidelines and Oversite**

Since there is little guidance within the professional industry on utility master plans the only other guidance is from the government. On a Federal level there is no guidance or requirements for utility master planning. In recent years through efforts of professional organizations such as ASCE, AWWA, and APWA there has been suggestions to legislators on funding of public facilities to require some type of planning documents before award of money to any entity (as a participating member of all three organizations, and serve on various committees, I have been directly involved in the efforts mentioned). However, all three of these professional organizations members do not agree on what specific requirements there should be in a utility master plan since many members enjoy the lack of compliance requirements on a Federal level yet still be able to receive federal funding.

On a State level the requirements can differ significantly. Each State can set their own requirements and there is little consistency in what the purpose of any of the requirements are. In contrasting three northwestern states; Washington, Oregon, and Idaho there is very little consistency in state requirements on utility master planning. Of the three Washington requires the most, and based on reviews of State requirements as well as interviews with professionals in
the industry, Washington appears to have the most comprehensive requirements in the country. Washington State is the only document that has any information about involving the public in utility master planning where it specifically states the following:

“Although public involvement is not specifically required by DOH, it is highly recommended throughout the plan development process. Public involvement can help identify issues and problems which need to be resolved; help prioritize improvements; educate policy makers and consumers of potential impacts of the plan; and help achieve consumer acceptance of the issues and what will be needed to resolve identified concerns. Some systems use an advisory committee to assist in WSP development. DOH recommends that, as a minimum, the utility should conduct a public meeting or hearing. Decision makers should be kept well informed about the plan throughout its development.”

Industry experts in other States doing utility master planning actually refer to Washington State requirements. In fact, in research for this paper, Washington State was the only state that provides a comprehensive guideline, but it is solely focused on water even though those same requirements could be applied to sewer or stormwater utilities. In discussions with utility managers and industry experts who have done work outside the three northwestern States stated that it is very inconsistent from State to State. No States, including Washington, provides any clear purpose for utility master planning, but does identify elements of a utility master plan.

Oregon has a looser guidance document. It is largely focused on complying with Oregon State Land Use requirements under Goal 11. Goal 11 criteria is really about minimizing the extension of utility services to prevent urban sprawl. What is interesting to note about Oregon’s land use requirements regarding extension of utilities to serve areas outside existing growth
boundaries, water is allowed to be extended while sewer is not. What is interesting about this is the impact to any surrounding community from failing septic systems is a far greater health risk than an individual water supply. The point being is that if the public understood this, the public out of self-protection would likely switch this allowing extension of sewer but not water to prevent urban sprawl. It is simply another indication the public has not been involved and these laws and rules were written with intentions other than protecting the public. While Oregon does not specify any public involvement requirement, it does equip citizens through Goal 11 to ask better questions about existing utilities and ability to serve. While no State documents that were reviewed for purposes of this paper stated explicitly the purpose of utility master planning, it is easily inferred in review of the State documents that the purpose is to address future needs and a way to pay for them. What should be noted is that the review of these documents by any State agency is not robust. They are reviewed from a check the box mentality that a utility master plan specifically discussed individual criteria but there is not verification of the data used (interviews with industry experts). These documents are essentially submitted and accepted rarely with any questions or concerns being raised (interviews with industry experts).

The problem this lack of comprehensive review poses is that if the States do not require a comprehensive utility master plan that is consistent on requirements, it is even more difficult to get the decision makers convinced that public involvement is needed. If you can do a plan for a tiny fraction of the cost, make gross assumptions in the plan with no scrutiny, there is little incentive to invite the public in the process. Especially if by inviting the public you invite scrutiny into the process which would increase both requirements and costs.

For purposes of this case study this paper focuses on the Oregon State requirements under OAR 333-061-0060. This requirement is actually focused on water systems, but once again
shows the lack of consistency. Even though to create a defensible sewer or stormwater master plan requires the same as a water master plan, the State of Oregon has no specific requirements for sewer or stormwater master planning like they do for water. It should be noted that Oregon is not alone in this. Every State reviewed for purposes of this paper only had specifics for water master planning to some degree. No States could be found that have similar guidelines for the other utilities. The one thing the State of Oregon does have different than most states is the Oregon Land Use Laws under OAR 660-011-0000. This law does require master planning for all utilities, but the focus is on preventing urban sprawl, not on critical elements of a master plan. Nor does this law specify any level of public engagement only satisfying the local requirements for public notice, which in the case of the City of Bend for these types of projects is 30 days with local public adoption.

To give some idea of how little is required and the lack of consistency, a quick comparison of a neighboring water utility to the City of Bend has a master plan that is a total of 62 pages long, no verified hydraulic model, and very little specifics about meeting future demands. In addition it is titled the Water Management and Conservation Plan, but submitted it as the water master plan even though the under the State of Oregon OAR 333-061-0060 these are two different things. The State accepted the document as satisfying both. In contrast the City of Bend’s water master plan is 111 pages long, with 9 appendices adding another 140 pages, has a rigorously calibrated hydraulic model, detailed GIS based maps detailing size, age, material, and condition of all of its water infrastructure. The City of Bend also submitted a water management and conservation plan that is 139 pages. Yet both the City of Bend plans are considered equal in terms of Oregon law to its neighboring water utility even though the neighboring plan could withstand little scrutiny if challenged. And even then should the public challenge, the utility can
say that the plan has been accepted by the State, giving the public the illusion that there is some oversite on these plans with some type of rigorous requirements. This is not simply an issue of fairness, this is an issue of public health and sets the public up for huge surprises in public investments needed. Based on this lack of rigorous oversite and complete lack of public process, it should not be a surprise to the industry experts, nor to the various levels of government that are trying to find funding, that there is a lack of public willingness to pay. We are asking the public to pay for an invisible system from the public’s perspective that they have no understanding of nor is there any real requirement to bring the public to any understanding of these systems.

The reason the elements and rigorous oversite are important to understand as part of this paper is that the City of Bend chose to include very detailed information in its master plan, which is key to having any meaningful discussion with the public. Without the detailed information, or any requirement for it, a public process is nearly impossible and the planning document becomes purely a technical exercise left to each entity to define.

**Elements of a Utility Master Plan**

Due to the lack of consistency in any requirements for utility master planning, there is also a lack of any consistency of elements within a utility master plan. As a result, many utility master plans are far from ideal (Boulos pg. 7-6) and contain whatever any individual State requirements may be. In both Washington and Oregon they specifically state that the requirements they identify are the minimums and a plan can have more, but neither identify what that more would be.
In general the following foundational elements are required in any utility master plan.

**System Background**

A description of the existing system which includes the current demands or flow capacities, compliance with regulatory standards, and general operation and maintenance requirements.

**Inventory of Existing Facilities**

Maps or schematics of the system showing size, location of facilities, condition, material of pipes, and approximate age.

**Analysis of Impacts from Future Growth**

An engineering analysis projecting impacts as a result of future growth.

**Analysis of Alternatives for Meeting Future Growth**

An engineering analysis that evaluates options for responding to impacts from growth or changes in environment.

**Recommended Plan for Implementation of New Projects**

A final recommendation of projects that need to be implemented to respond to impacts and the timing of the need for these projects to be complete.

**Financial Analysis**

An analysis of costs of projects and revenues needed to pay for the projects through rates and system development fees, and alternative methods that could be used to pay for the needed projects.

Within each of these elements there are many assumptions that must be made. As an example when determining population growth there is more than one methodology (Boulos pg. 7-38).

And regardless of which method is chosen, determining the impacts as a result of that growth is
also an assumption. As an example, an increasing population does not necessarily equate to an increase in flows because societal behavior can and does change. So an increasing population can have a declining per capita impact. This is simply pointing out that the complexity of something as relatively routine as population projection tied to a future impact has a number of complexities that need to be considered. At the same time you have environmental changes happening that are very speculative in terms of how the amounts, or lack thereof, of precipitation will impact these utility systems. There is also an assumption of the density of the growth that needs to be made and where that density occurs. All of these assumptions can have significant impacts on the analysis of what needs to be done to address the impacts associated from these assumptions. While I could continue on listing many more assumptions that need to be made, the point is to show that these assumptions are not all necessarily engineering assumptions. Many are in fact policy assumptions, yet it is very rare for the public or even elected bodies to be a part of developing these policies. What complicates this even further is that there does need to be an understanding of how these assumptions cascade in an analysis impacting other assumptions that do result in technical engineering impacts. So a balance of technical understanding with public interest is also required. And all the assumptions impact the amount of money that will be needed to address future impacts.

These assumptions are a critical factor for any meaningful public process. Yet most within the industry, including elected bodies, rarely want to get into this level of detail and would much prefer the public stay out of it (based on a number of interviews with engineers and elected officials). Elected officials I spoke with wished to remain anonymous. It is not uncommon to see any engineer respond to the idea of inviting the public into these planning assumptions repeat the
modern day refrain from earlier in this paper by the first known water engineer, Sextus Julius Frontinus, stating that these decisions are best left with the experts who know better.

Beyond the assumptions that are needed, there is the analysis that needs to be done. Under the State of Oregon guidelines it states the following;

“Identification of alternative engineering solutions, and associated capital and operation and maintenance costs, to correct system deficiencies and achieve system expansion to meet anticipated growth, including identification of available options for cooperative or coordinated system improvements.”

What makes this statement interesting is that while the State of Oregon says they require an analysis of alternative engineering solutions, and require consideration of life cycle costs not just capital costs, the reality is that this is rarely done (interviews with industry experts). Based on review of many various master plans and discussions with industry professionals that develop these plans, the most common thing in master plans is a single identified engineering solution with associated capital costs. This happens because the process to actually achieve what the State of Oregon requires is in reality mind blowing complex considering networks of piped systems can literally have tens of thousands of solutions, even for small systems. It is relatively easy to figure out capital costs for any one project, but determining an equivalent basis for life cycle costs when comparing pump solutions versus gravity flow solutions is an incredibly complex process in itself. It’s really not a surprise that Oregon does not actually enforce this because in discussions with the State agencies involved in over seeing these utility master plans, the staff do not even fully understand what this entails. This does not make the State of Oregon wrong, but they need to provide some guidance on how to achieve this. And the most fundamental element needed to achieve this is some type of calibrated model for the utility, which no State even
May 28, 2016
Tom Hickmann

requires. It is seen as optional. It is absolutely impossible to do any type of comparative analysis without some type of calibrated model to guide the decision making. Without it the individual is simply taking their best guess based on experience, which can vary greatly based. Again we are back to the issue of public involvement and public transparency. If only highly experienced people can make reasonable guesses and estimates, there is no door for the public to enter to provide any input.

More often than not these plans are based on many unverified and unchallenged assumptions that are made by well intentioned experts that the public is forced to trust blindly (interviews with industry experts).

The reason the elements of utility master plans and the assumptions needed are relevant to this paper is to identify that any kind of meaningful public process in utility master planning will require new thinking and new tools to approach the problem. This is not necessarily new thinking and has been identified that a new approach to these utility master plans must occur utilizing new tools and technology (Elmer pg. 138).

Purpose of Public Process

Good public process is about problem solving (Birkland pg. 4) with the hope that it will also develop public support. The very foundation of our democracy is founded in public involvement, and how that involvement should occur was the basis of debate between the Federalists and the Anti-Federalists (Morgan p. 80 – 83). While the debate over a national government was in a much larger context than utility master planning, it would be negligent to not consider this fundamental debate when it comes to utility master planning and how this public engagement is woven into the fabric of our democracy at every level. As stated by Bleiker, “public administrators with responsibilities for solving tough problems are as effective
in accomplishing their missions as they are good at engineering and developing public support” (Bleiker Chptr 2 pg. 6). So it is a bit surprising that there has not been extensive history of public process in utility master planning since this infrastructure is the very basis of existence for any community.

**Key Actors in the Utility Master Planning Process**

Birkland in his book *An Introduction to the Policy Process* dedicates an entire chapter to roles and responsibilities in the development and design of policy (Birkland Chapter 4). While Birkland is focused on knowing who these actors are on a national level when developing policy, it is no less important to know who the key actors when operating on a local level. It is also very different designing policy and implementing policy (Birkland pg. 263) than it is to do utility master planning with public involvement. None the less knowing who the key actors are in the development of any utility master plan is key to understanding the benefits and challenges of any public process that would accompany it (Bleiker Chptr 5 pg. 1). Knowing these key actors also helps understand the ability for this case study to be used in a broader context.

Based on personal experience as well as many interviews with industry experts one of the key players is typically the manager of the utility. This individual typically decides who is going to develop the plan and what the elements of the plan are. The amount of autonomy this individual has is largely dependent on the organizational structure of the utility. In general, publicly owned utility managers have less autonomy than privately owned or utilities that are organized as a special district. Based on both experience and interviews with industry professionals, the more autonomy the utility manager has the less likely they want to engage the public in their utility master planning. Private utilities and utilities organized under a special district tend to have master plans that are less rigorous (interviews with industry experts).
Along with the utility manager, there are other key staff players within an organization typically involved. Finance managers, operations managers, and project managers to name a few. These individuals can have a great deal of influence on various aspects of a utility master plan and their involvement, or lack thereof, can determine the success of a good utility master plan or not (Boulos pg. 7-48).

Elected Boards and Councils also are key actors in master planning. These elected officials are often not effective when dealing with infrastructure due to its complexity (Elmer pg. 649). Elected officials rarely want to get into the nuanced details involved in utility master planning, but at the same time want public support for the programs they approve. If an elected official believes there is concern over an investment program in utilities, they would likely be supportive of a more rigorous public process. In addition, elected officials can force staff to have a more robust utility master planning process when staff is unwilling to do so. If elected officials are resistant to a public process, or agree to appropriately fund the process, there is no way for staff to actually do anything but bare minimums.

Engineering consultants are the workhorse behind utility master planning (Boulos pg. 7-1). They are the individuals that drive the analysis and most importantly can identify accurately the strength and weakness of any plan. However, they will not speak against their client’s guidance so even if a consultant believes the analysis is inadequate they will not be public about it. The do identify if data was incomplete, what assumptions had to be made, and how those assumptions impact the overall plan. The biggest challenge in working with the engineering community is that they are very reluctant to invite a large public process into the work that they do out of concern that the public could push for ideas that could later be a failure. No engineering firm would want to knowingly have their name associated with a failed plan.
Special public interest groups can provide an intense amount of public pressure and scrutiny of any utility master plan (Elmer pg. 648). These groups can be developer interest groups where decisions in a utility master plan can impact both what a developer can do and when they can do it. In addition, most communities have some type of development charge that is tied to new infrastructure that are identified in a utility master plan. The cost impact to the development community can be contentious and as a result can be the most vocal regarding impacts from any utility master plan (Elmer pg. 648).

Another special interest group can be environmental interests. New proposed utilities can have environmental impacts in terms of new growth, where it’s located, and the carbon footprint that is created. As a result environmental interests can be a key player in the success of any utility plan depending on how active they are in any given area (industry expert interviews).

Business interests also play a key role in utility master planning. The ability for any business to grow can be highly dependent on the availability of infrastructure. This community can also have very strong political sway and political ties that can shape a utility master plan (industry expert interviews).

Rate payers and general public should be an obvious key actor. While this is the community that ultimately pays the bill for a utility master plan and the associated infrastructure improvements, this community is also the least likely to be directly involved in a utility master plan. In many cases rate increases are the driver for their engagement and if unhappy can cause turnover in elected officials during election cycles (industry expert interviews).

Public relations can also be a key player. Their involvement is often limited to announcing a public meeting, or helping to review a public statement about a completed utility master plan in the traditional sense. But public relations should be considered beyond a limited
role and consider utilizing them for public process guidance and being the facilitator for public meetings controlling the conversation in a neutral manner (industry expert interviews). In the City of Bend case study, public relations was a critical component of success.

City of Bend Case Study

As mentioned prior, the City of Bend took a unique approach to dealing with its sewer Collection System Master Plan (CSMP). So unique in fact that there is no record of any City or community having done anything even close to similar. The focus of this case study is to look at the conditions that pushed the City to bring the public into the master planning process and how the City did it. The public process in this case study took nearly two and a half years and hundreds of hours of meetings with an eighteen citizen committee appointed by the City Council. The result of this process has been widely discussed in the engineering world, and the land use planning world, as a new way to engage the public on utility infrastructure master planning. The final results of the City’s process was a utility master plan that was adopted by a public committee, a planning commission, the City Council, and all the way through the Oregon land use process without a single voice of opposition. More importantly the process developed broad public support for significant capital investments over the next twenty years, and has continued to prove successful even as the investment needs identified in the CSMP have changed significantly in terms of amounts and timing of investments.

Below are the detailed steps that the City took, and why, to make this a success. The public process is documented in the City of Bend CSMP Appendix 2. However, that documentation lays out what occurred at each meeting. It does not identify many of the critical steps that the City took and why. The source of the majority of the information below is from my own firsthand experience as the Engineering Director who was ultimately responsible for the
entire process and master plan. The issues of what drove the City to take this approach and the
detailed and nuanced steps the City took cannot be overlooked if there is any possibility of
determining the repeatability of what the City did.

Why the City Used Public Process in their Master Plan

For purposes of being able to draw any conclusions on the usefulness of the City of
Bend’s approach, it is important to understanding the context which drove the City to use the
approach. This section outlines some of the history that motivated the City to engage the public
in their CSMP.

The City of Bend is a community of approximately 82,000 that experienced explosive
growth beginning in the early 90’s that continued until 2006 (CSMP Appendix 3A pg. 3). In
fact, the City grew from a community of just over 20,000 in the early 90’s to 80,000 by 2006
(CSMP pg. 2-7). This explosive growth pressed the City services to the limits and left little time
for advanced planning. The City did a water and sewer master plan in 1996 that called for
significant investments to meet the demands of growth. Unfortunately none of the projects that
those plans called for were constructed. As a result the sewer system grew haphazardly until
2006 when new management called for a new and updated master plan be done for the City
sewer collection system.

At the completion of that study in 2007, it caught many people’s attention because of a
nearly $130 million price tag associated with the 2007 master plan. The City approved the master
plan without much public debate and very little public input. A few engineers representing their
land development clients did raise concerns publicly about the plan and were critical of the plan.
But their critiques went largely unheard and un-responded to.
At the same time as the 2007 master plan update, the City found itself in a growing controversy surrounding the water utility. A major capital investment was being proposed that would have significant rate impacts. The controversy grew to a point that an outside group was formed to stop the water project and challenge the City in Court. From the public perspective they did not see the water and sewer utilities as separate entities so the growing chorus of dissent concerned the City Council politically.

By 2010 land developers began to realize the cost implications to their projects as a result of the 2007 sewer master plan and they expressed their concerns to individual Council members. Those complaints resulted in amending the 2007 master plan four separate times, again without public involvement. Each amendment to the plan only raised more concerns and more questions by the public. After years of arguing over the plan, the City had spent hundreds of thousands of dollars doing the amendments, in addition to the hundreds of thousands spent on the original plan, and yet had little public support to pay for any of the infrastructure the plan called for.

Even without public support, and even having received comments not supporting the capital investments identified in the plan, the City began constructing one major project identified in the plan that was estimated to be $60 million. The City Council agreed to multiple years of double digit rate increases all during a time when the economy was down. The construction on the $60M project began in 2010, but by 2011 the concerns of the public were becoming very loud exacerbating the political concerns. The City Council asked City staff to pause the projects called for in the plan in the spring of 2011 while the Council reconsidered the implementation of the plan. This was after $10 million was already constructed and in the ground, but not functioning since the rest of that project was not yet constructed.
The public concerns were a result of the City facing multiple years of double digit rate increases in its sewer rates, and a feeling by the public that they were not being listened to or having their concerns addressed. Adding to the concerns was the continued economic recession that began in 2008. The sting of that recession was still fresh in the community and increasing costs in any area were under serious scrutiny from the public.

In the summer of 2011 a diverse group of business and land development interests sent a letter to the City Manager and to Council asking for a redo of the 2007 plan. The letter also asked for a more robust public process in the redo of the plan. The Council agreed to the request and asked staff for a plan of how this would be done.

City staff explained to the Council that public process at the level being requested had never been done on a full utility master plan, and the City staff, nor its consultants, could find any documentation that this had ever been done anywhere. As a result the City staff were left to develop an approach to engage the public in its CSMP. City staff researched public process in utility master planning and discovered many times public process had been used on a smaller scale with roads, neighborhood sewer, and individual elements of water master plans. But all of these public processes were very different than what the City Council was proposing, or what the public was requesting. As a result the City staff teamed with consultants, the City Council, and some public individuals that had expressed desire to participate in the CSMP to develop an approach that would provide meaningful input into the process while not jeopardizing the engineering judgement (described above) that is needed in the development of these plans.

The context of what drove the City to use a public process in its utility master plan is an important piece of this case study. Had the public outrage and pushback not occurred it is likely that the City would have done what it had always done with its utility master plans and it is
unknown if the City would have been able to implement the plan in the end. An important part of this case study is understanding its repeatability and it may only be repeatable in situations where contention already exists and would serve no benefit where there is none. A similar case would need to be done in a community that had no contention over its public utilities to determine if a public process would still benefit the community.

The Approach the City Used

The City had to take many steps to develop a process that provided good oversite and management of the project, while simultaneously not allowing that oversite to drive the public process without some checks and balance. This took several months to pull together and a great deal of effort prior to even starting any actual public process or master plan study. Some of the considerations that the City had to deal with was concerns expressed by City staff. The engineers involved, along with City operational staff, repeatedly expressed concern that the issues involved in developing the CSMP were too complex and too risky to allow citizens with no accountability to drive the process (the Sextus Frontinus argument from above). In fairness to the staff and engineers involved, it is ultimately their licenses that are on the line should any decision result in a failed project. Finding a balance in the process was difficult and time consuming since there were no prior models of this being done to build from.

The first step the City took was to develop an internal team of staff with designated roles and responsibilities. While this may seem obvious and trivial, this step ended up being very crucial in the overall success of the project and really speaks to the importance of key players. In this case the director of engineering was fully empowered to direct the work and hold team members accountable. The director of engineering was also independent from the utility manager. This
autonomy prevented the potential of a utility manager, or the engineering director, to ignore or modify things without oversite.

The next step the City took was developing a request for proposal seeking a consultant team to do the CSMP, but to utilize new technology and tools that could ultimately be used in public engagement. In response to the City proposal only one firm had a tool and process that would work, but even then the engineering firm was reluctant to the idea of pulling the public into the process to the point that the public would actually have some ability to adjust what was traditionally engineering factors. This was not a minor issue. Engineers take their licensing very seriously and tend to be very conservative in their approach to solving problems, meaning they make sure factors used will result in the public safety. Finding engineers, including myself, to be fully on board with this approach was difficult. In part because there was little to no evidence that something like this had ever been done. Protecting the engineers’ judgement in the process was a significant challenge and since these documents are ultimately required to be signed and stamped by an engineer (OAR 333-061-0060), the engineer ultimately has the final say so. If the engineer is not in agreement they can ultimately refuse to sign the final document. The concern engineers had, including myself, was that we would be forced to overrule a decision made by the public process, which would have in affect nullified all of the efforts of the entire process.

At the same time that the City was soliciting proposals from engineering firms, the City Council worked with City Staff and three members of the public to develop the public process. The three members of the public that the Council and staff worked with to determine the process for selecting people to participate in the new CSMP came from key players in the community; one from development interests, one from business interests, and one from environmental interests. The City solicited the public to apply for serving on a sewer master plan committee and
May 28, 2016
Tom Hickmann

received 36 applications from a broad cross section of the public. The City Council working with the three members of the public narrowed the candidates and selected 18 members all with different backgrounds and different technical skills.

After the appointment of the 18 members to participate in the new plan and the engineer was selected, the City believed it would be best to have a neutral third party play a moderator role in the public process. Out of all of the steps the City took to make this a success, this one proved to be the most critical. Having worked with a number of public relations firms over the years, I have learned that they need to have some fundamental technical understanding of the issues that they are moderating. Without this they can’t help set boundaries in the discussion since they themselves have no understanding of the boundary between the nuanced technical aspects versus those that are more public policy. From my perspective and experience, without this understanding by the moderators the process breaks trust down rather than build it.

The public relations firm the City hired had extensive technical background on infrastructure, government functions in terms of regulatory compliance, and were very familiar with the Bleiker method of developing informed consent. This method really focuses on helping participants understand the need and ramifications of decisions. They may not agree with the need, or even the ramifications, but are sufficiently satisfied that they don’t oppose. This process allows participants to agree in part without feeling that they have given in completely. It also allows them to move incrementally to some agreement on issues (Bleiker Chptr 4 pg. 5). The public relations firm reported directly to the City Manager office to maintain their independence from the engineering team and served as an independent communication back to the City manager office. This also proved critical since it allowed individuals from the public to voice concerns directly to the public relations firm, who in turn conveyed them to the City manager. This
May 28, 2016
Tom Hickmann

provided a check and balance on the director of engineering to ensure they were not
predetermining outcomes or manipulating the process to their advantage.

One of the more challenging aspects was developing a scope of work with an agreed upon
schedule for completion. In any master planning process developing the scope is a challenge and
very critical to a successful outcome (Boulos pg. 7-5). In this case that challenge was even more
difficult trying to incorporate the public process. It was decided that the engineering team would
develop a scope of work with a schedule and then present that to the newly formed committee
appointed by the City Council. In developing the scope of work, tasks that would normally be
loosely defined (i.e. hydraulic modeling to develop alternatives) required a great deal of thought.
Critical variables to the hydraulic model were all broken down into distinct meetings allowing
the committee to learn what each of the variables were, the potential impacts they have on the
outcome, and engineering limits to them. In developing the scope of work, it also developed the
meetings that would need to be held and the timing of those meetings in the overall schedule.

Prior to the scope of work being presented to the committee, the committee had to decide its
own structure by defining a chair and vice chair. The committee also chose a name for itself
settling on the Sewer Infrastructure Advisory Committee (SIAG). In addition, staff requested that
the committee develop a steering subcommittee to work directly with staff and consultants to
prepare content for each meeting to the committee. This ended up being another very critical
piece to the success. The steering subcommittee was made up of three members; land use
attorney, developer, and environmental interest. These three helped staff frame the content to be
presented at each meeting to make sure it was clear and concise and helped set parameters for
each issue. In other words when engineers expressed concern about a particular variable being
set too high or too low, the steering committee helped set the upper and lower limit to be
presented. This allowed the engineers to have some comfort that variables would not be set unrealistically and forcing the engineers to do an analysis around something they knew had no merit.

While all of the above defined how the City would engage the public, on what issues, and when, the City still needed to define the technical approach of how to do it. Utility master plans are typically what would be a “black box” exercise, meaning analysis is being done by engineers using mathematical models that spit out answers. Those answers are typically evaluated by engineers and then modifications to variables are made based on engineering judgement to refine the answers. The challenge is that the analysis is very technical and tedious. It also takes a great deal of time and requires engineering judgement. Doing all that work transparently is difficult and at best creates a situation of dueling experts that the public must simply trust. A key tool the City used in its process was the use of new tools in hydraulic modeling that have the ability to bring the public into this process.

The new hydraulic modeling tool the City used was a software program called Optimatics. This program, is based on the use of genetic algorithms that was first developed at the University of Michigan by John Holland in the 1970’s. In the 1980’s Angus Simpson learned about genetic algorithms at the University of Michigan and refined the concept to apply to piped networked systems. The concept behind genetic algorithms is that these pipe networked systems grow and change with time to adapt to the needs of a community. The idea being that by using the same concepts that drive life to be its most efficient form through DNA, these piped and networked systems could do the same. The technology refined by Angus Simpson gave unique DNA to each element of a piped system then through the use of massive computing power, run the genetic algorithms allowing the system to define itself to be its most efficient form. In this process,
depending on the size of the system being analyzed, tens of thousands to millions of alternatives get evaluated. This is completely unique to this tool.

The first time this was ever applied to an actual piped system was in 1995 in Fort Collins – Loveland Colorado (interviews with the founder of Optimatics, Jeff Frey). The results of that showed that a significant savings could be achieved with strategic future capital investments. It also gave the decision makers a high level of confidence that they were being both efficient and wise in the use of the public funds. Since 1995 it has been used extensively in Australia and parts of Europe, and only about a dozen Cities in the US. The City of Bend first utilized it on its water master plan in 2011 without a public process. The engineers using the tool at the time, nor the City, fully understood how this tool could be used in a public process. It was at the end of the analysis of the water system that I began to understand what the full potential of this tool is.

There are two noteworthy things that make the use of the Optimatics tool incredibly powerful. First is that traditional hydraulic modeling of these systems was done by a single individual who developed up to a dozen different scenarios of alternatives to analyze based entirely on that one individual’s judgement and experience. The engineer would analyze various hydraulic solutions, after which the selected solution would undergo a capital cost analysis. The use of the Optimatics tool also has the ability to compare and contrast the costs for each unique hydraulic solution, both the capital and life cycle. In all of the research done for both this paper and done in preparation for this public process, no other hydraulic modeling tool could be found that can do this type of cost equivalent and hydraulic analysis simultaneously. This provides a level of transparency that was rarely shown in traditional master planning efforts and shows that a low initial capital investment can have very high life cycle costs in a transparent fashion.
The second important aspect of this tool is that it allows sensitivity analysis on selected outcomes. What this allows is the ability to show what it would take to achieve any desired outcome other than the one that the analysis found initially. This allows the public to question any given variable or individual project and see what it would take to get a different outcome. In the same respect, this same ability exposes bias because you have to show how much you changed a variable to achieve a predetermined outcome. This proved to be very critical in getting the public trust and buy in to the end results of the CSMP. The engineer doing the analysis, nor the operations staff, could hide bias to favor an outcome that they desired. In the same way a developer could not hide bias. This truly made the entire process transparent.

The ability to analyze so many alternatives in such a comprehensive manner for the first time gives engineers the ability to actually achieve what the State of Oregon is really asking for;

“Identification of alternative engineering solutions, and associated capital and operation and maintenance costs, to correct system deficiencies and achieve system expansion to meet anticipated growth, including identification of available options for cooperative or coordinated system improvements.”

This tool can actually achieve what was always previously viewed by most in the engineering community as something that was impossible to do. As a result it’s not a surprise to learn that many engineers resists this technology because it is literally seen as “too good to be true”. Engineers also resist this technology out of fear that it replaces the role of the engineer in the master planning process. In my own experience it has been very challenging to get engineers to see this as a tool that can expand their abilities and give them much more credibility in the analysis they do. This was also confirmed in multiple interviews with engineering consultants
who are familiar with this tool and our public relations firm that was used in this process, Barney and Worth.

The Process

After the City defined the approach, it was no less important that the process could actually implement the approach. The process was largely outside of the City’s control since the process was determined by SIAG. The City was aware of this from the start which is why so much time was spent developing the approach. Regardless of what process the SIAG decided, the approach the City developed put some limits on how far the process could wander from the approach. This was done by the well-defined scope, the use of the advanced modeling tool, and the specific steps required to determine the variables going into the model. The first step was for the City to present to SIAG the difference between the traditional master planning process and the process proposed to be used. It was broken down in the table below.

<table>
<thead>
<tr>
<th>Traditional Master Planning</th>
<th>Bend’s Master Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on engineering solutions</td>
<td>Focus on community values, then engineering solutions</td>
</tr>
<tr>
<td>Planning assumptions taken at face value</td>
<td>Planning assumptions closely scrutinized</td>
</tr>
<tr>
<td>Solution set limited</td>
<td>Solution set expanded</td>
</tr>
<tr>
<td>Approvers: City Council</td>
<td>Approvers: community members, City Staff, &amp; City Council</td>
</tr>
<tr>
<td>No special decision-making modeling</td>
<td>Optimization modeling</td>
</tr>
</tbody>
</table>

Despite this effort, prior to the initial meeting a couple of the SIAG members wrote a letter to the entirety of SIAG suggesting they needed no consultants, and no staff involvement, and that they were entirely capable of developing the entire plan. This included a PhD Economist and professor from OSU, and a medical doctor. Fortunately the majority of SIAG rejected this thinking, but the same members that produced the letter continued to intentionally try and create
doubt in the process. In the end I believe this actually created confidence and trust in the overall process and in staff since the doubt was discussed and addressed openly.

SIAG met 21 times, from July 2012 to September 2014. This represented over 1,100 hours of volunteer time of the SIAG members. Preparing materials for each SIAG meeting involved significant effort, which resulted in at least four times the number of hours by consultants and City staff, which was tracked in the budget. In addition to the consultants and City staff, the steering committee spent considerable additional time outside of SIAG meetings working with City staff and consultants. These efforts included the review of project related information, revising presentations, coordinating with and presenting to other civic groups and informing the City Council. City staff and the Consultant team engaged SIAG and the public with clear and concise presentations. Several iterations of each presentation were typically required, with a final review conducted by SIAG’s Steering Committee.

When the City Council appointed the members to the SIAG, the City Council also defined SIAG’s assignment. The assignment was to:

- Identify community priorities
- Review and evaluate short- and long-term collection system needs
- Identify a community supported financial strategy to pay for the needed infrastructure
- Consider the financial, engineering, economic, growth management and political implications of various alternatives
- Meet with community members to provide information on the CSMP project
- Provide updates and a final recommendation to City Council

The process was completed in five major steps agreed upon by SIAG:
1. **Orientation:** SIAG members learned about projects already underway and the challenges facing the collection system. They took tours of lift stations and locations where sewage was backing up in manholes to better acquaint themselves with the existing collection system and visually evident deficiencies.

2. **Immediate Capacity Issues:** SIAG members assisted in identifying priority areas and solutions for immediate sewer capacity issues. They chose two areas out of nine that allowed design solutions to begin immediately. They also participated in sizing decisions for the Colorado Lift Station, one of the selected projects. This allowed the SIAG to make a decision without the use of any of the advanced modeling. As the SIAG process continued after this immediate decision and they began to understand and learn about the power of the optimization they became concerned that their initial decision may have been incorrect. This was beneficial since they learned to understand how powerful the tool was and the comfort that came with making investments based on the output of the optimization.

3. **Optimization Inputs:** SIAG recommended policy-level decisions for the optimization model (population growth and density, redevelopment areas, flow), the solution sets that went into the model (pipes, pumps, storage, satellite treatment, conservation), and a financial strategy to pay for improvements. They also selected several sensitivity analyses to run, including water conservation and current and future loading conditions. SIAG’s recommendations were informed by the engineering team to ensure they were technically sound, and compliant with state and federal standards.

4. **Solutions:** SIAG reviewed initial, intermediate, and final optimization results. Members also reviewed options for condition improvements, ongoing repair and replacement, and
local area improvements, as well as various financial scenarios to pay for improvements and budget for ongoing replacement.

5. Recommendations: SIAG members made seven presentations to City Council during the course of the project to inform Council, and request acknowledgment and concurrence with SIAG’s early decisions and their final recommendation. SIAG’s made policy-level recommendations to the City Council, which helped guide subsequent work on the CSMP. This ensured not only community support for the CSMP, but also City Council understanding and approval. More importantly this was not coming from City staff or consultants, which provided a higher confidence in the recommendations. Decisions made by SIAG are documented in the CSMP.

The decision making process used by SIAG was also critical. As discussed, SIAG represented a broad range of experience and perspectives, with all members having an equal role in deliberations and decisions. SIAG meetings were professionally facilitated using the Bleiker method previously described. This process does not focus on consensus, nor do the end decisions require consensus. Given the complexities of Bend’s sewer collection system and range of stakeholder interests, unanimous agreement was not likely for all SIAG decisions and recommendations. As decisions were reached, dissenting opinions were documented and recorded along with the majority’s recommendations. SIAG members who represented or were affiliated with a community organization were encouraged to inform the organization’s constituents of SIAG’s work, and report any concerns or questions to SIAG. This allowed a broader reach than just those involved in the process.

SIAG members also held a number of public presentations to neighborhood associations, Chamber of Commerce, Rotary Clubs, the Bulletin Editorial Board, and many more. Staff would
attend to provide technical support, but the speaking was primarily done by SIAG members.

Again the message coming from people other than staff and expert consultants provided more credibility and supportive response.

The Results

The CSMP ended up costing the City $3M in consulting fees for all the public process and the development of the CSMP documents. That is a significant investment when as mentioned earlier the actual requirements for utility master planning are very light and certainly don’t require this level of analysis or public engagement. A typical utility master plan can range from as low as $20,000 up to $500,000 (industry expert interviews). In this case, because of the advanced modeling and the data intensity that is required to make it reliable, even without the public engagement the CSMP by the City would have cost just over $1.5M. That is high by any standards. The remainder of the $3M was all attributable to the public process itself. To determine if that level of investment was warranted the end results need to be carefully considered.

The CSMP identified nearly $100M in investments in the City sewer system over the next twenty years identifying more than a hundred individual projects of various sizes. This is a very significant investment for a community of less than 90,000 people who were also facing an $80M investment in its water system, and over $200M in its transportation system. More remarkably was that the CSMP was also calling for more than $50M of the $100M to be spent in the next five years, with the remainder of the $15M fairly evenly distributed over the following fifteen years.

The results of the City’s master planning public process are hard to argue with. This is seen by looking at four different points during and after the process, along with contrasting to
other City of Bend master planning processes. During the process of the CSMP the level of confidence and trust in City staff and in the consultants the City hired went from a point of primarily distrust, to a point of near complete trust. This was determined informally through verbal surveys from the City public relations firm. Some of the comments are captured in the CSMP Appendix 2 Memo from SIAG to City Council dated October 31 2014. From an anecdotal perspective, at the beginning of the SIAG process some of the members were reluctant to speak with me and interactions were distant at best. In the end these same members were verbally supportive of me and the engineering team and decisions the team made as a whole.

When it came time to adopt the CSMP, it went through four different public adoptions where at any of them the public could weigh in and express support or concern. Historically when the City has held these types of adoptions for its master plans there was always some level of opposition to what the plans called for. However in this case the SIAG approved the CSMP unanimously in the end with no public opposition. The CSMP was then presented to the City of Bend Planning Commission who again voted unanimously in favor of the CSMP, with several of the commissioners commenting how good the plan was and the confidence they had in it. In contrast, just two years prior the City of Bend brought its water system master plan to the planning commission for approval where more than one hundred citizens attended opposing its adoption, and the planning commission narrowly approved that plan.

The CSMP was again unanimously approved by the City Council which had usually split votes on issues of infrastructure spending. In fact some members of the City Council ran on campaigns of stopping what they deemed out of control spending on infrastructure and engineering consultants. The City Council only received public comments supporting the CSMP.
May 28, 2016
Tom Hickmann

Finally the CSMP was approved by the Oregon State Land Use department without a single voice of opposition. In contrast the City’s water master plan two years prior was challenged through the Oregon Land Use Board of Appeals.

It is one thing for the City Council to approve the CSMP, it is another for the City Council to increase its sewer rates, and for the public to support the increases, to pay for it. This is yet another indicator of the results of the efforts that went into the development of the CSMP. In late spring of 2015 the City Council agreed to increase its sewer rates by 9% (average of $50 per residence). The increase received no public opposition, which is a very strong indicator that the efforts undertaken were worth it. In contrast the water rates were being increased by 5% and received numerous public complaints.

The approval points and the support to pay for increases are a great indicator of positive results. However, time ultimately is a better indicator if that support is sustaining. The CSMP was approved in December of 2014. By the end of 2015, just a year later, the City was seeing a much more intensive growth rate than what the CSMP projected. During the process the engineers had told SIAG they were not comfortable, and did not recommend, using a low or medium growth rate in the modeling out of concern that a high growth rate would cause the plan to become outdated quickly. SIAG ultimately did not follow the engineer’s recommendation and used a medium growth rate in the planning model. As a result of this lower growth rate, and the fact that SIAG decided to apply that growth evenly across the City, the CSMP did not reflect reality of what was actually occurring by the end of 2015. This was necessitating a significant change to the CSMP requiring projects that had been deferred beyond ten years were now immediately required. This was resulting in an increase of $20M on top of the $50M in the first ten years. This kind of change was not expected to be well received or supported.
Over the months of April and May of 2016 the City Council and the public were informed of the significant change to the CSMP. While the news troubled the City Council and caused them to question the CSMP efforts, they ultimately approved the increase in expenditures and investments needed. In addition to the Council supporting these investments, the community has been supportive as well. This was highly unexpected, and City staff strongly believed that the confidence in the CSMP would quickly wane. To date the City Council and the community continually hold it up as a model of success in terms of public process and input.

The results really do speak for themselves in this case, that the investment was warranted and much more than public support for the CSMP was achieved, community trust was also a valuable result. However, it has only been a year and a half since the CSMP adoption so the longevity of these results has not really been answered. Only additional time will be able to tell this. Like everything, it is certain that these results have a shelf life. As new community members come to town, new Councils are elected, and those involved in the SIAG process fade away, the positive results are not likely to carry the City through the entirety of the twenty year plan that the CSMP defines. So the City will need to still figure out how to carry this support on into the future.

**Repeatability**

The question of how repeatable of what the City of Bend did is much more difficult to answer than the immediate results of the process that was employed. Since this kind of public engagement has never been done in utility master planning before, there is no easy comparison of success. In fact, many places across the country have done utility master plans without any public opposition or knowledge. As a result several things need to be considered that made this process unique, and therefore possible to determine if it is actually repeatable.
First is the political climate. The City of Bend was literally in a political firestorm on a local level focused entirely on the issue of infrastructure spending. This is what ultimately drove the City to take this very public approach. Without that kind of political climate, there may not be support to financially pay for what it cost to take this master plan through the public process.

Another factor is the people involved, from the City staff to the individual SIAG members. An unsupportive City staff, or even one that is only loosely engaged, could result in a very different outcome. The City staff that were involved in this case, while skeptical, were still fully engaged and ultimately supportive of the process. This requires staff that are not normally very engaged with the public, to become very comfortable working with the public in an open and transparent manner. That is difficult to force or create if staff is unwilling.

The SIAG members could have been very different and unwilling to engage to the level that these members did in a different process. That could be culled out during the selection process, selecting members that only show a high level of interest. But their interest may not be nearly to the level that these members were which could easily change the outcome of success on this.

Beyond the people is the system that is being analyzed that would need to be considered. Not all systems lend themselves to the use of optimization. The City of Bend happens to have an incredibly complex system which lends itself to the functionality of the optimization process. Less complex systems don’t work well in the optimization model since the power of that comes from calculating many, many different options and scenarios. There are systems that just don’t have that many options, and as a result would not likely work well. It is unknown if public trust could be established to the same level without the use of the optimization tool.
Another factor is the number of critical steps the City took to make this a success. Had the City not done any one of these, it would have most likely resulted in a different outcome. It is also unlikely that another entity would want, or need, all of the same critical steps. This difference may result in different outcomes.

The closest comparison that is available is one that used the optimization process in a much less rigorous public process in the City of South Bend Indiana. That process was more focused on just developing support from the elected officials and did not have the same structure the City had. None the less, the end results were somewhat similar in large part due to the use of the optimization tool that allowed for the sensitivity analysis and comparison of so many alternatives. However there is no data to support this and the source of information on its success came from the Optimatics company who makes the software. An attempt was made to speak with anyone involved from the City staff in South Bend and I was unsuccessful in being able to speak with anyone. The public works director from South Bend is quoted on the Optimatics website as saying “We recommend any community facing this kind of historic environmental infrastructure investment engage the Optimatics team and process to assure themselves and their rate payers that they have exhaustively pursued and achieved the optimal solution.”

The other thing to look at the potential for repeatability is speaking with those in the industry that were part of this process. This includes the public relations firm and the engineering firms as well. All involved have marketed this approach to other communities for master planning. All believe that the process could be repeated, just not to the same level or intensity that it was in this case.
Conclusion

Bringing the public process into the master planning is still challenging regardless of the new tools available, but the results of this case study do make it clear that the benefits in the correct situations would likely result in greater public support. To the extent optimization tools are available for transportation systems, or other utilities besides water systems, they should be used to bring the same level of transparency.

Prior to deciding to bring in the public into the master planning process there are many things to consider. Bleiker has a very good checklist process to consider in Chapter 6 of its handbook. The ICMA has a checklist available as well for determining the need for public process, but just because there is a need, the correct tools and data would also need to be available to create the transparency. Quoting Bleiker in Chapter 5 of his handbook he states the following:

“Just because there are lots of good reasons for engaging in citizen participation, does not mean that you ought to charge into doing citizen participation; ... it does not mean that you can afford being unaware of the absolutely pivotal role citizen participation plays in your ability to accomplish your mission”

Bringing in the public needs to be thought out carefully or it is far more likely that undesirable results could occur. In terms of utility master planning that means that a poorly organized public process could result in a very poor plan, or a complete loss of trust in those trying to develop the plan. It is important to get the public to understand the limitations that they bring to the table to ensure a utility plan is not developed with hasty and poor decisions in the inputs.

It could simply be that engineers and utility managers need to be more open and transparent in their key decisions and not be afraid to have those questioned and tested. This is probably the biggest takeaway from this process that the engineering community must realize the days they
once enjoyed as being seen as the unquestionable expert is no longer. Even if the public scrutiny is nonexistent, public managers of these systems have a responsibility to the public they serve that goes beyond simply providing a service. The public deserves the opportunity to weigh in on these plans in a meaningful way. While it may be uncomfortable for engineers to do this, if these systems are going to be fixed requiring large public investment, an informed public will be required. I think that is the hardest thing for engineers to come to terms with, that they are now the focus of intense public scrutiny.
Bibliography


Oregon Health Authority. OREGON ADMINISTRATIVE RULES OREGON HEALTH AUTHORITY, PUBLIC HEALTH DIVISION CHAPTER 333, DIVISION 61 PUBLIC WATER SYSTEMS (2016).


West, C. (2003). *City of Bend Sewer System Master Plan*. 
Interviews with Industry Professionals

Barg, Libby – Principal, Barney and Worth Associates, Public Relations

Worth, Clark – Owner, Barney and Worth Associates, Public Relations

Stangel, David P.E. – Managing Principal Murray Smith and Associates, Engineers, Specializes in Utility System Master Planning (Boise)

Roundy, Shad P.E. – Murray Smith and Associates, Engineers, Specializes in Hydraulic Modeling for Utility System Master Planning (Portland)


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