

APPENDIX A. SUMMARY OF NEEDS, BARRIERS & RISKS FOR THE TOOL

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1. Executive Summary

This report summarizes the needs, barriers, and risks for the developing a decision support tool for critical areas and land use planning, and is meant to help focus and prioritize the potential development of the tool. This report is meant to capture all recommended needs, barriers, and risks, and a subsequent report (project prospectus) will line out our proposed solutions and workarounds to these needs, barriers, and risks. This summary provides information gathered through conversations with stakeholders, discussions and meetings with our advisory committee, and our online end user survey(s). In all, we have received input from 127 planners and scientists affiliated with 61 different organizations, including 10 counties, 27 cities, 9 state agencies, 2 federal agencies, and 13 other organizations.

Our research confirms that planners must meet multiple land use goals while also managing their growth with limited resources, including protecting critical areas and water resources, directing development away from hazardous areas, encouraging compact development, retaining open space, providing housing and economic opportunities, and investing in transportation, public facilities, and services. Some are moving beyond planning on a site by site or jurisdictional basis to solve problems at the watershed scale or further integrating city and county planning. Others seek to implement restoration actions where they will have the most benefit for species and Puget Sound recovery. Many wish to assess and monitor how well their critical areas regulations are working.

While there are a large number of tools, maps, models, and datasets available to address many of these challenges, they have not been integrated to provide an interrelated picture of all the variables that need to be considered in land use planning. **More than 81 percent of our survey respondents believe that developing an integrated tool for land use planning is extremely or very important**, and when we asked them to comment on the need for an integrated tool, they responded with the following:

- “[This tool] would help identify where land use designations make the most sense on the ground.”
- “[This tool would be] especially [useful] on a larger scale for long term planning.”
- “Too much planning is done using poor quality information or is based on the ‘these four other jurisdictions did it so it must be right’ method. We’ve got lots of science and data but it needs to be useful to the practitioners and decision makers”
- “Mapping services can be inconsistent and a central repository would benefit all.”
- “[This tool would organize] existing resources and make users aware of datasets they may not otherwise consider using or know exist.”
- “There are too many wasted resources with all the funds spent to do the same work.”
- “[A tool that] allows all considerations to be analyzed/queried at the same time, on the same platform, with current data, is essentially THE tool needed for accurate, insightful, and quick planning analysis”
- “[This tool is] especially [needed] for smaller jurisdictions with limited resources.”
- “[This tool would provide] better education of the public and more efficient implementation of local regulations.”
- “[This tool] can greatly improve planning decisions.”
- “[This tool would] increase productivity and data reliability.”

Respondents said they would use the tool throughout planning processes for multiple needs. These include supporting comprehensive plans and shoreline master plans (SMPs) by helping identify appropriate locations, intensity, and design of new development, as well as assessing critical areas regulations and finding the best locations to implement restoration actions. The tool will need to provide a platform that links models and databases to bring together all the information for critical areas and land use planning into one tool. The tool could help present the available data that could assist in planning processes, and this could be especially useful for smaller jurisdictions. It would also help integrate city and county planning, integrate countywide and other local planning policies with regional scale questions, and integrate land use planning and water resource planning.

Respondents indicated that the priority uses of the tool should be identifying and protecting critical areas, informing decisions about where to allow more intense levels of development, informing decisions about planning or locating areas to restore, and compliance monitoring and identifying where sensitive areas need greater protection. To support these priorities, users need a tool that allows them to overlay and query many layers, calculate cumulative impacts, evaluate buildout scenarios, show areas where multiple planning goals intersect or conflict, and calculate benefits of protecting critical areas or doing restoration work. Respondents recommended developing a tool that integrates all these functions to create a robust decision making platform that can intelligently prioritize areas for protection, restoration, development based on each end user's specific goals, and calculate the impacts of specific buildout, regulatory, and restoration scenarios. Respondents also recommended that the tool be structured to support local decision processes. Resource agencies recommended that it also provide a platform to guide the questions and information agencies want local jurisdictions to consider during planning updates.

However, there are barriers and risks that need to be considered. We have identified unique challenges to consider for scoping the tool, data and model inclusion, use of the tool, tool development, funding, and maintenance. For scoping the tool, the primary risk is taking on a scope that is too broad. For data and model inclusion, there are risks associated with quality and coverage, unclear interactions between datasets and response variables, and models inaccurately representing activities that are actually occurring on the ground. For use of the tool, there are risks associated with structuring the tool to easily support planning decisions, differences in planning needs and capacity between jurisdictions, citizen use, misuse, or misinterpretation, and lack of local adoption and buy in. The primary risk for tool development is not securing adequate funding and/or experienced contractors for full tool buildout, but there are also challenges related to database interoperability, processing power, data security, and new technological developments. Once the tool is built, there is a risk that it will not be maintained due to lack of long-term funding and ownership for the tool itself, as well as lack of support for updating key data layers at the originating agencies. Many potential solutions to these risks and barriers have already been suggested, and listed herein, and we will further address them in our prospectus to ensure that our end product is viable, resilient, and sustainable into the future.

2. Introduction

The first major task for Commerce’s scoping of a new decision support tool for critical areas and land use planning was collaborating with stakeholders to identify needs, priorities, barriers, and risks for the tool. We conducted an extensive outreach and stakeholder process, and assembled a large advisory team to help us. In all, received input from 127 planners and scientists affiliated with 61 different organizations, including 10 counties, 27 cities, 9 state agencies, 2 federal agencies, and 13 other organizations (Table 1). Our analysis of their input will guide development of the tool to ensure that it meets end user needs and focuses on their planning priorities. It will also identify barriers and risks for the tool that will need to be considered and addressed in our prospectus for tool development.

Input from 127 planners & scientists affiliated with 61 organizations:

- 10 Counties
- 27 Cities
- 9 State Agencies
- 2 Federal Agencies
- 13 Organizations

This summary provides information gathered through conversations with stakeholders, discussions that took place at our first advisory meeting on October 28, 2019, and the results of our online end user survey(s). We had 43 participants in the first advisory meeting, and they spanned 18 state agencies, two federal agencies, 12 local governments, two consulting firms, and eight other organizations. Following the advisory meeting, we sent out a detailed online survey aimed at potential end users of the tool. We received 68 responses from 47 local government planners and 16 state agencies. Statistics on needs and barriers for the tool were calculated from those online survey responses. We also received 24 additional responses to a previous version of the survey that was sent out to advisory group members for review, bringing total survey input to 92 responses. Responses to the previous version of the survey were not included in the statistical calculations due to substantial revisions to some questions based on feedback and new ideas, but their input, as well as input from the first advisory meeting was included in the general analysis overall, as a great deal of information on needs and barriers was gleaned from those responses as well. The needs, priorities, barriers, and risks for the tool that we identified through all of these efforts are summarized in the following sections.

TABLE 1. COLLABORATING AGENCIES & ORGANIZATIONS

STATE AGENCIES	Department of Ecology Puget Sound Partnership Department of Health	Department of Fish & Wildlife Department of Transportation Office of the Chief Information Officer	Department of Natural Resources Recreation & Conservation Office Department of Archaeology & Historic Preservation
FEDERAL AGENCIES	U.S Environmental Protection Agency	U.S. Forest Service	
COUNTIES	Clark County King County Skagit County Whatcom County	Island County Kitsap County Snohomish County	Jefferson County Mason County Thurston County
CITIES	City of Bellevue City of Buckley City of Cosmopolis	City of Bellingham City of Burlington City of East Wenatchee	City of Bonney Lake City of Chehalis City of Everett

	City of Fircrest City of Kirkland City of Mukilteo City of Port Angeles City of Sultan City of Walla Walla	City of Hoquiam City of Mercer Island City of North Bend City of Seattle City of Tacoma Town of Winthrop	City of Kent City of Monroe City of Othello City of Shoreline City of Tumwater City of Zillah
ORGANIZATIONS	Washington Stormwater Center Futurewise Audubon Society	University of Washington Puget Sound Regional Council Thurston Regional Planning Council	Mason Conservation District Washington Water Trust A Regional Coalition for Housing Association of Washington Cities
CONSULTANTS	Water & Land Natural Resource Consulting	EnCo Environmental Corporation	E Squared Environmental Consulting

3. Needs and Priorities for the Tool

3.1 General Need for the Tool

Our research confirms that planners must meet multiple land use goals while also managing their growth with limited resources, including protecting critical areas and water resources, directing development away from hazardous areas, encouraging compact development, retaining open space, providing housing and economic opportunities, and investing in transportation, public facilities, and services. Some are moving beyond planning on a site by site or jurisdictional basis to solve problems at the watershed scale or further integrating city and county planning. Others seek to implement restoration actions where they will have the most benefit for species and Puget Sound recovery. Many wish to assess and monitor how well their critical areas regulations are working. As populations grow and climate change progresses, additional complexity will be added as planners navigate the effects of these factors on their planning requirements. There are a large number of tools, maps, models, and datasets that have been built to address individual challenges, but they have not been integrated to provide a an interrelated picture of all the variables that need to be considered in land use planning, and the effects of those variables on one another.

Our survey results and discussions confirmed the need for an integrated tool for land use planning. More than 80 percent of survey respondents said that all the tools they need for effective planning are not integrated and easy to use. More than 81 percent of respondents believe that developing such a tool is extremely or very important, 14 percent feel that it is somewhat important, and only 5 percent feel that it is not important for their work. Further, we found that the two biggest limitations preventing use of existing mapping and analysis tools are that 1) potential users are not aware of all the tools that are available, and 2) the tools they need for planning are not integrated, making combined viewing and analysis for integrated and comprehensive planning

Multiple Land Use Goals:

- Protect critical areas and water resources
- Avoid hazards
- Compact development
- Retain open space
- Provide housing
- Employment & economic growth
- Transportation & facilities

under the GMA difficult. End users need a tool that includes current regularly updated data, is easy to use, includes as much information as possible in one tool, makes their work more efficient, and provides the ability to analyze and show relationships between datasets, layers, and tools. After exploring some of the proposed functionality, 92 percent of survey respondents said that an integrated, regional tool would provide added value for their work and that they would use it. When we asked stakeholders whether they believe this tool is needed and why, response was overwhelmingly positive. Some responses from stakeholders included the following:

- “A tool like this sounds like it would be helpful for informing long-range projects and plans like PSRC's Vision 2050 and county comprehensive plans. Often there is a sense of where growth should occur theoretically, but having a richer, more integrated dataset would help identify where land use designations make the most sense on the ground.”
- “I think such a tool would be incredibly useful to inform local policies and plans, and project permitting (also restoration prioritization and mitigation opportunities).”
- “Yes, especially on a larger scale for long term planning.”
- “The tools we have show where land uses are...but do not have any analysis associated.”
- “Yes, too much planning is done using poor quality information or is based on the "these four other jurisdictions did it so it must be right" method. We've got lots of science and data but it needs to be useful to the practitioners and decision makers”
- “This tool, with any or all of the potential aspects described, would help the region and the state to make decisions more cohesively. The joining of resources will also facilitate state-wide consistency and has the potential to increase the utilization of data to make decisions.”
- “I can't imagine a single planner that wouldn't be extremely excited about this project. It is possibly the most important tool to develop. It would save individual jurisdictions enormous amounts of time and money.”
- “I previously was skeptical about this tool. Would it be too clunky with as much data and alternative scenarios as it would support? But after switching jurisdictions, it's clear that mapping services can be inconsistent and a central repository would benefit all.”
- “Yes, there are too many wasted resources with all the funds spent to do the same work.”
- “It organizes existing resources and can make users aware of datasets they may not otherwise consider using or know exist.”
- “Yes! [A tool that] allows all considerations to be analyzed/queried at the same time, on the same platform, with current data, is essentially THE tool needed for accurate, insightful, and quick planning analysis”
- “Especially [needed] for smaller jurisdictions with limited resources. YES.”
- “Yes, many local governments do not have the resources to expend on such a resource and the ones that are publicly available do not function to the needed level of service.”
- “I can see the value, and especially value added for agencies working state-wide. I can see the value of local entities viewing what other entities have already completed, how they've already tackled similar problems, etc.”
- “An integrated regional tool that assesses how well the critical areas regulations are protecting critical areas would be extremely important.”

Limitations of Existing Tools

- Not aware of all tools
- Tools are not integrated

92% of survey respondents:
“an integrated, regional tool would provide added value.”

- “Very much so...Our planning and permitting is still very much oriented to site by site review which cannot solve environmental problems that have their roots at the broad scale.”
- “Yes, it’s too hard for a landowner, developer, or planner to know all of the potential resources.”
- “Yes, our world does not end at jurisdictional boundaries.”
- “Yes – if successful, it would allow for better education of the public and more efficient implementation of local regulations.”
- “We need to unify data sets used by different levels of government.”

Survey respondents said they would use the tool throughout planning processes for multiple needs. These include supporting comprehensive plans and shoreline master plans (SMPs) by helping identify appropriate locations, intensity, and design of new development, as well as assessing critical areas regulations and finding the best locations to implement restoration actions. The tool would also be used for developing sub-area plans, zoning code amendments, assessing UGA expansions, and conducting buildable lands analysis. Some respondents expressed interest in using the tool at the site level for selection of development sites or permit review, if high enough resolution datasets are available for certain applications. Stakeholders want to use the tool for budgeting, planning, feasibility, design, permitting, communication, and monitoring processes and most believe that it would be used regularly by local, regional, and state stakeholders at multiple scales. The tool should be integrated within planning departments, natural resource organizations, realtors, businesses, and the citizenry to democratize best available science and get everyone working on the same knowledgebase.

There will be differences in the priorities of users from different jurisdictions or organizations for what they want to get out of the tool. Our advisors suggested that planners in more metropolitan areas and resource-minded organizations will be most likely to use the scenario planning and evaluation functions of the tool. Other jurisdictions do not have experts working on their critical areas issues, and the people in charge of critical areas planning may not use or be aware of any of the existing maps or tools. Those users will primarily want to use the tool to look up fundamental information (i.e. basic identification of critical areas). The tool should be able to answer both types of questions.

Our analysis indicates that the most important need is to pull together all the known information for critical areas planning into one tool. Long range planners are often scrambling for information, or missing information. Many models and databases already exist and are waiting to be used, but we are missing a platform for linking them. The goal should be an authoritative one-stop platform that promotes use of best available science, identifies any data discrepancies, shows which data have been verified, and is used at all jurisdictional levels. The tool could help communicate the data available to assist in planning processes, and this could be especially useful for smaller jurisdictions. It would also help integrate city and county planning, integrate countywide and other local planning policies with regional scale questions, and integrate land use planning and water resource planning.

Use of the Tool

- Comprehensive planning
- Shoreline Master Plans
- Critical areas regulations
- Restoration planning
- Sub-area plans
- Zoning code amendments
- UGA expansions
- Buildable Lands Analysis
- Permit review
- Monitoring

3.2 General Priorities for the Tool

We asked our end users and advisors to vote on the most important general uses for the tool so that we can focus on those areas as we prioritize which tool functions should be developed first. The top four uses for the tool remained consistent between the two groups (Figure 1):

1. Identifying and protecting critical areas
2. Informing decisions about where to allow more intense levels of development
3. Informing decisions about planning or locating areas to restore
4. Compliance monitoring and identifying where sensitive areas need greater protection

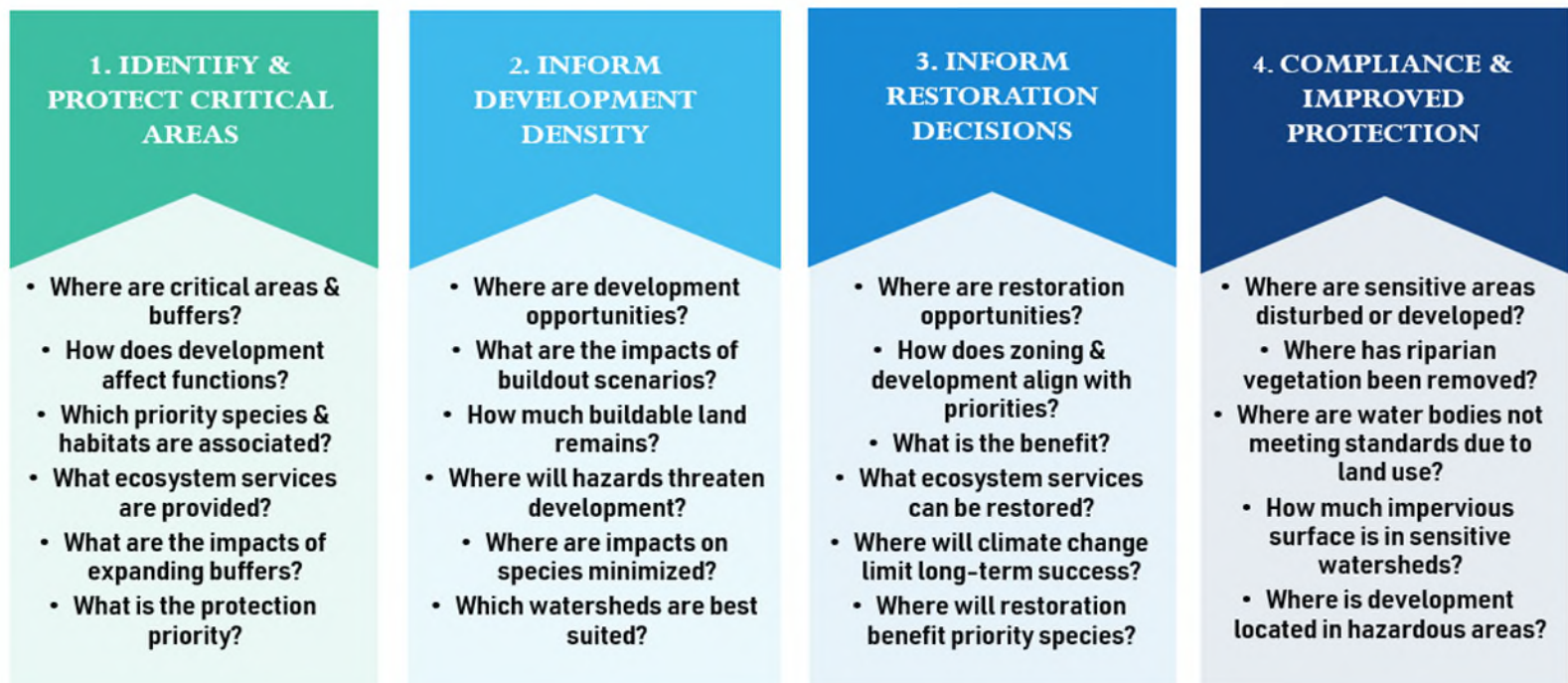


Figure 1. Priority uses for the tool and key questions.

We also asked end users to select all the potential uses of the tool that would apply to their work, without ranking them in order of priority. This provides some insight into which uses of the tool would be the most broadly applicable to users. There is substantial overlap with the more general priorities previously delineated, so this can further guide our efforts to make the tool as useful as possible within the top priorities. The potential uses of the tool that applied to at least half of the survey respondents included:

- Identifying/delineating critical areas (74%)
- Analyzing changes in land use over time (65%)
- Guiding development away from environmentally sensitive areas (64%)
- Identifying locations where infrastructure should be expanded to accommodate population growth and protect critical areas (62%)
- Assessing the impacts of land use decisions on environmental factors at multiple scales (local, regional, watershed; 61%)
- Planning for climate change (61%)

- Identifying how policy or zoning scenarios/changes could help meet development targets (i.e. areas for upzones or UGA expansion; 58%)
- Monitoring effectiveness of critical areas protections and policies (58%)
- Selecting/prioritizing areas for development or zoning (56%)
- Identifying buildable land (56%)
- Analyzing changes in land cover over time (52%)
- Identifying the effects of critical areas designations on other planning elements (50%)

3.2.1 Identifying & Protecting Critical Areas

Planners are required to identify and protect critical areas under the GMA, and this was the highest priority use of the tool for most stakeholders. Eighty five percent of survey respondents said they would be interested in using the tool for this purpose. Users are most interested in the locations of critical areas and buffers, associated species and habitats, ecosystem services provided, and protection priority, as well as how development affects critical area functions and what benefits and land use impacts could be expected from buffer expansion.

An important need is to develop a comprehensive map of critical areas across jurisdictional boundaries that provides planners with all of the available critical area data. This map would facilitate cross-jurisdictional planning and help develop habitat connectivity and corridors for critical areas. It can also be used as a building block for adding functionality to assess impacts of land use decisions on critical areas. In addition to showing where critical areas are located, the tool should show the least or most significant areas for ecological, salmon, and riparian functions (among other functions and values) to help guide restoration, mitigation, and protection efforts. Planners are also moving toward understanding effects of decisions that occur outside critical areas and buffers, so it will be important to include the hydrologic and landscape connections that affect critical area functions and health (and are needed to follow GMA requirements for protecting downstream resources). The tool could be a powerful way to get jurisdictions out of site by site planning and show the connections to the whole system.

The general public should be able to access information on critical areas that present hazards (i.e. flood hazard areas or geological hazard areas), along with recommendations on how to manage land located in these areas. In addition to showing where known hazards are located, the tool could be useful for showing where there are gaps in knowledge regarding natural hazards. Maps may identify hazards in some areas, but that does not necessarily mean there are no hazards in other areas. Having a tool that shows how many people live in geologically hazardous areas and points out those areas of uncertainty could be used to promote further mapping and would be a priority use of the tool for the Geological Survey. Insurance underwriters and bankers might also be interested in using the tool for risk assessment.

Another stakeholder priority is to create a comprehensive inventory of CAOs and resource recommendations, including critical areas buffer ranges for local jurisdictions (i.e. stream buffer ranges, wetland buffer ranges, steep slope or marine bluff setbacks, and prairie habitat buffers). It would also be

#1 Use of Tool: Identifying & Protecting Critical Areas

- Locations of critical areas and buffers
- Associated species & habitats
- Ecosystem services provided
- Impacts of development
- Regulatory scenarios
- Comprehensive regional critical area map for cross-jurisdictional planning
- Access to information on hazards
- Inventory of regulations and recommendations

helpful to spatially input RCW and WAC requirements and policies so that some other processes and rules are already baked in, or at least accessible, while also providing for input of local values. However, maps of these regulations and policies do not currently exist for most jurisdictions, and mapping that information would require substantial code research so this would likely need to be a future add-on.

3.2.2 Informing Development Density Decisions

Informing decisions about where to allow more intense levels of development was the second highest priority for most stakeholders and 77 percent of survey respondents said they would be interested in using the tool for this purpose. The tool should guide users through the process of determining the most appropriate areas for development density based on multiple goals and needs, and could provide important information for buildable lands analysis. Planners need to identify opportunities for development, while taking into account important considerations for minimizing impacts on critical areas, ecosystem services, watersheds, and priority species, as well as avoiding natural hazards. Alongside these considerations, stakeholders felt that the tool should help protect other important resources from development impacts, such as sand and gravel (aggregate) resources and culturally and archaeologically significant areas, to allow planners to achieve more integrated planning assessments.

In addition to identifying the best places to develop, there was a lot of interest in using the tool to assess the impacts of buildout scenarios. It would be useful to include interactive data layers which have defined, quantitative relationships to the response variables people care most about (i.e. BIBI, salmon productivity, streamflow/hydrology) and that can be used to assess cumulative effects of buildout scenarios over time. There is an assumption that if critical areas are buffered they are protected, and some planners (incorrectly) believe that if development is not occurring in the buffer it is not having a negative impact. Additionally, some urban areas where planners presume that it is okay to increase density because there are no critical areas present are extremely important hydrologically. At the permit scale, more pressure is put on protection decisions when high density zoning is in place, and it is difficult to preserve critical area buffers when exceptions must be allowed for reasonable use and other factors. The tool should be able to inform these land use decisions that occur outside critical areas by linking them with their effects on critical areas, hydrology, and other variables.

The tool should piece together what has already been done in terms of land use and zoning and allow the user to look at different ways to do it in the future. For example, it could show the effects of continuing with a given land use or zoning (or switching to an alternative) in a certain area on watershed functions. This would allow planners to evaluate standards and policies along with their connections to landscape processes and the health of watersheds and the region. In this way, the tool could help inform policy and zoning changes, such as where upzoning or downzoning should occur to accommodate development while maximizing critical area protection.

#2 Use of Tool: Informing Development Density Decisions

- Determine most appropriate areas based on multiple goals & needs
- Minimize impacts on critical areas, watersheds, priority species
- Avoid natural hazards
- Assess buildout & zoning scenarios
- Show land use connections to landscape & watershed processes

3.2.3 Informing Restoration Decisions

Informing decisions about planning or locating areas to restore was the third highest priority for most stakeholders and 80 percent of survey respondents said they would be interested in using the tool for this purpose. The tool should guide planners through the process of determining the most important areas for restoration. Planners are interested in identifying opportunities for restoration, examining how zoning and development aligns with restoration priorities, and assessing the benefits of restoring areas in terms of ecosystem services and economic values. They would also like to consider potential limitations on long-term success of restoration efforts due to climate change. This process would focus restoration efforts in the best areas on the landscape to achieve benefits for multiple goals and could align local restoration efforts with regional recovery needs. It could also help justify restoration and mitigation projects by providing information on return on investment.

Restoration actions are trying to solve problems in most cases, but there is an issue of treating symptoms without getting to the root causes of those problems. Our advisors suggested that the tool could help point to potential solutions that can be applied to problems like flooding, erosion, or sedimentation. There is usually insufficient data to show exact correlation or cause, but the tool could include some kind of risk analysis that makes that uncertainty clear and provides recommendations for what can be done. For example, the tool could say we are 60 percent sure that deforestation in this watershed is the cause of a sedimentation issue, so restoration or changed land management practices in this area would help alleviate that problem.

3.2.4 Compliance & Improved Protection

Compliance monitoring and identifying where sensitive areas need greater protection was the fourth highest priority for most stakeholders and 80 percent of survey respondents said they would be interested in using the tool for this purpose.

In order to protect critical areas and other sensitive areas, there needs to be monitoring and adaptive management to ensure that regulations are having the intended effect. During the Critical Areas Ordinance (CAO) update cycle every eight years, planners need to consider whether or not policy changes are needed, and if changes are made, how those changes would influence the protection of critical areas. Integrating change detection and land use maps with maps that show the locations of critical areas, riparian zones, and other sensitive areas can provide the information needed to quantify how much and what kind of change has occurred in those areas over a particular time period and assess where regulatory changes are needed. Stakeholders are particularly interested in identifying 1) where development or disturbance has occurred in sensitive areas, 2) where vegetation has been removed from riparian areas, 3) where water bodies are not meeting standards due to constituents affected by land use, 4) how much impervious surface has been built in sensitive watersheds, and 5) where existing and planned development is located in

#3 Use of Tool: Restoration Planning

- Determine most important areas for restoration
- Alignment of zoning & development with restoration priorities
- Benefits of restoring areas in terms of ecosystem services
- Limitations from climate change
- Assess return on investment
- Apply solutions to the causes of problems instead of symptoms

#4 Use of Tool: Compliance & Monitoring

- Monitoring & adaptive management
- Land cover change in sensitive areas
- Vegetation removal in riparian areas
- Water bodies not meeting standards
- Impervious surface in sensitive watersheds
- Development in hazardous areas
- No Net Loss of shoreline and critical areas

hazardous areas. For compliance monitoring, the tool could be used to measure no net loss of shoreline and critical areas within the SMA and GMA to determine if these regulations are working.

3.3 Priority Tools and Scenario Planning Functions to Include

We asked end users to indicate the types of tools or scenario planning capabilities that would be most useful to them to support their priority needs. Querying capability and ability to overlay many layers were almost universally important to users. Additionally, the top four scenario planning functions that users want to see in a tool are 1) ability to calculate cumulative impacts of land use decisions (39% chose as a top priority; 85% marked as important), 2) ability to evaluate buildout scenarios (34% chose as a top priority; 63% marked as important), 3) ability to show areas where multiple planning goals intersect or conflict (30% chose as a top priority; 70% marked as important), and 4) ability to calculate benefits of protecting critical areas or doing restoration work (i.e. ecosystem service values; 24% chose as a top priority; 65% marked as important).

Priority Tools & Scenario Functions

- Query and overlay layers on maps
- Calculate cumulative impacts of land use decisions
- Evaluate buildout & zoning scenarios
- Show where multiple planning goals intersect or conflict
- Calculate benefits of protecting critical areas or doing restoration
- Normalizing & standardizing land use effects

3.3.1 Cumulative Analysis of Land Use Decisions

The highest priority functionality was the ability to calculate cumulative impacts of land use decisions. The tool should show the cumulative effect of land use decisions over time and help communicate that information to decision-makers. Cumulative analysis on a county or city-wide basis could show how much has changed cumulatively over the eight year planning cycle and at various time steps. Then planners could use that information to inform decisions about how to change land use activities or zoning. Analysis of cumulative impacts (and analysis of other elements like compliance and monitoring), could then be rolled up to track large scale changes over time and see how the region is doing on its priorities and no net loss.

3.3.2 Evaluating Buildout Scenarios

The second highest priority functionality was the ability to evaluate buildout scenarios. This would allow planners to evaluate alternative options for zoning in terms of their effects on critical areas and ecological functions over time. To allow planners to prioritize and differentiate between areas on the landscape, models would need to be linked in a way that recognizes that not every piece of ground has the same ecological or development value.

3.3.3 Finding Areas of Compatibility and Conflict for Competing Goals and Interests

The third highest priority functionality for survey respondents was the ability to show areas where multiple planning goals intersect or conflict. Local government planners are especially interested in a tool that can help find win-win outcomes and areas of compatibility with respect to competing interests and requirements (i.e. habitat, working lands, water resources, and development density). This functionality would be very useful for comprehensive planning at the watershed scale. One of our advisors highlighted the need for a tool that shows mitigation needs and requirements for development scenarios alongside opportunities to rezone areas to get connectivity, habitat, water resource benefits, protected areas of working lands, and other win-wins. It would allow planners to assess their available land resources and plan for how to allocate those resources to meet all their requirements over the long-term. A tool that includes indices for hydrologic condition, habitat productivity, and other factors

with normalized values could calculate the best combinations. Over time, jurisdictions will need to consider additional factors in their planning decisions as they pursue new goals, such as transitioning people off wells and septic systems in urban growth areas (UGAs). It will be important for the tool to be able to incorporate new variables in analyses as needed.

For areas where competing goals and interests conflict, the tool can provide transparency in decision making processes by helping planners show their work and provide justification for decisions. The tool should be able to show the logic and data that decision makers use to solve problems and balance competing goals, rather than producing outputs and numbers in a “black box”. This would help decision makers explain the rationale for decisions to stakeholders, and it would allow stakeholders to see for themselves the basis on which decisions are made. The tool should be able to demonstrate to stakeholders how emphasizing a certain resource or priority over another changes land use and restoration decisions.

3.3.4 Calculating Benefits of Protecting Critical Areas or Doing Restoration Work

The fourth highest priority functionality for survey respondents was the ability to calculate benefits of protecting critical areas or doing restoration work (i.e. ecosystem service values). Adding this functionality would provide a very powerful communication tool for explaining ecological processes and why plans need to protect them, both to decision makers and to citizens. If models can be linked to produce economic values for critical areas protection, restoration, and other land use decisions, that information may be more impactful for decision makers. The tool should use science to evaluate land use alternatives in terms of the effects on biological elements, as well as the risks, costs, and benefits for people. That information is needed for effectively explaining these issues to elected officials. Stakeholders believe a tool that could accurately report both ecological and economic impacts for different regulatory scenarios (different CAOs or land use zoning) is exactly what is needed.

3.3.5 Normalizing and Standardizing Land Use Effects

A related priority for the tool that came out of our advisory discussions is to normalize or standardize the way land use effects are tracked and reported, creating a time and space context across land uses and jurisdictions at multiple scales. Normalizing the effects of land use decisions over an entire watershed or jurisdiction would create a common ruler that can be applied around Puget Sound to compare one watershed or jurisdiction to another. This would be of enormous benefit to scientists as well as planners. It could help answer questions for endangered species protection, such as finding opportunities to help Chinook salmon and orcas. It could also be used for recovery, restoration, and alternative futures. For example, planners could use the tool to experiment with moving a mixed use or other land use area to the middle of the watershed, then see the normative condition of the watershed if that decision were implemented (via an index such as the Hydrologic Condition Index). The results could be used to communicate the effects of locating industry in a particular area to decision makers. Normalizing the ecological functions would allow users to see the linkages between changes in land use, watershed functions, critical areas, and ecosystems, and it could also start to get at the no net loss concept.

3.4 Supporting Planning Decisions in Local Jurisdictions

Most users of our tool will be using it for comprehensive planning and other long range planning. We will need to structure the tool to support these planning processes and it is important to come up with good articulations of decision outcomes. Our end user survey results and conversations with stakeholders have helped us gain a better understanding of the decisions planners are making and their questions. More information could be gained by compiling the GMA planning goals and looking at which questions need to be answered to know whether or not each goal is being achieved. From there, we can find and integrate the appropriate datasets and models to inform those answers.

To support comprehensive planning, the tool should be designed to inform revisions to critical areas ordinances (CAOs), shoreline master programs (SMPs), urban growth area (UGA) expansions, and rural zoning density. Specifically, it should help counties and cities determine whether changes in these regulations would protect and provide for no net loss of critical area functions and values. This is accomplished by 1) avoiding/minimizing harm to ecological functions and 2) identifying appropriate ways to offset remaining harm. Because not all critical areas contribute equally, the platform should bin (or allow users to bin) critical areas into ~3-5 tiers to show relative priority; each tier should be associated with a different level of mitigation requirements (or in the case of hazards, different development standards). The platform should be designed from the ground up to identify and standardize efforts to monitor benchmarks and outcomes, with the intent of making future updates more successful. In short, this tool should help users understand relative priorities across the landscape and quantify the environmental “drag” and “lift” associated with development so that Growth Management Act (GMA) and Shoreline Management Act (SMA) regulations can achieve no net loss, and efforts beyond GMA/SMA can work to achieve net ecological gain by focusing on priority areas.

Local planners need guidance that provides analytical steps to take the assorted information and tools and put them together. A decision framework that breaks out into areas to restore, areas to develop, and critical areas for protection based on best available science and knowledge of watershed processes would be useful for planners. It should move from a broad scale down to a finer scale. A decision framework would help local jurisdictions who are moving beyond regulating and planning on a site by site basis by showing the process to go through and what information to look at. The first step could be just a website with links where local governments can go to get that information, and the second step would be putting it all together. This could provide a basis for changing policies. Jurisdictions could also use the tool to show their work and reasoning to the public, which is usually hidden behind the scenes.

Local planners often do not have enough information, or not enough good information, and stakeholders from local governments said that having agencies tell cities and counties which information is good and should be used would be helpful. Many smaller jurisdictions rely on agencies to tell them what tools and data are available. The tool could be used to inform local governments about the data that is available and how it translates to their requirements. However, a priority for local governments

Supporting Local Planning

- Structure to support comprehensive and long range planning processes
- Inform revisions to CAOs, SMPs, UGA expansions, rural zoning density
- Regulation changes for No Net Loss
- Priority areas for net ecological gain
- Decision framework for planners to put information and tools together
- Provide Best Available Science
- Show reasoning to the public
- Include local data

will also be the ability to use their own data in the platform, because local scale information is often more refined and detailed than regional datasets.

3.5 Opportunities for Commerce and Other Agencies to Guide Local Planning Efforts

This tool could provide an important opportunity for Commerce to guide the questions and information the agency wants local jurisdictions to consider during comprehensive planning, CAO and SMP updates, and for iterative decisions between updates. If the agency wants local governments to assess impacts on water quality, water quantity, habitat, downstream resources, and other important factors under the GMA, this could be the place to make sure those questions are being asked and work is being shown. The tool should also be aligned with other city, county, and state agency mandates and could be used to bring the values of other agencies into a space where they can be given due consideration (Figure 2).



Figure 2. Examples of decision framework alignment with state agency values and regulations.

A priority use of the tool for regulatory agencies and environmental organizations is as a means to incorporate best available science (BAS) into critical areas and comprehensive plan updates. To do this, user inputs to the scenario planning functions of the tool should identify when choices for buffers and other measures are outside of BAS, and the tool may need to limit some choices based on best available science. By directing local governments to use the BAS, the tool could provide a normalized and standardized way of getting everyone operating on the same knowledge base. For data producers, the tool could provide a way to make sure users of their data are using it in an intelligent way. Resource agencies and Commerce have also expressed that developing standardized regional map layers for critical areas and zoning is a high priority for regional analysis.

Local jurisdictions will be asking what's in it for them if they use the tool, and what's in it for them might be some kind of cover, safe harbor, or assurance that they did the analysis right and can rely on the information. If Commerce directs jurisdictions to use the tool to look at certain elements for their comprehensive plan updates, the agency could say that after some QA/QC is done and it is approved, the jurisdiction's comprehensive plan is valid. The tool could be used to document use of the BAS and could allow agencies to review comprehensive plans and shoreline plans much more efficiently.

3.6 Tool Outputs

The most requested tool output was an online mapping application (requested by 92% of survey respondents). The online mapping application should include a dashboard that allows users to experiment with different scenarios. Another important output would be data downloads (63%), including the ability to download post-analysis GIS data from the tool for the user's study extent. Other important outputs include links to supporting documents (56%), printable reports (52%), and recommendations (44%).

3.7 Next Steps for Tool Design

In collaboration with our advisory committee, we will develop a conceptual design for the tool that meets the needs and priorities that have been identified.

4. Potential Risks and Barriers for Developing the Tool

We asked our advisors and potential end users to provide input on risks and barriers for developing the tool. There are unique challenges to consider for scoping the tool, data and model inclusion, use of the tool, tool development, funding, and maintenance. These risks and barriers will need to be addressed in our prospectus to ensure that our end product is viable, resilient, and sustainable into the future.

4.1 Scoping the Tool

Defining an achievable and tangible scope for the tool will be the first challenge. Stakeholders and end users will need to be consulted to learn about their needs and priorities to ensure that the tool will meet their needs. We will need to make sure that we reach out to an appropriate range of stakeholders from local governments, resource agencies, tribes, non-profits, consulting firms, and other organizations. We plan to do this via surveys, interviews, and advisory group meetings. However, even if all the appropriate stakeholders are consulted, there is a risk that priorities for the tool could change dramatically part way through development, due to Ruckelshaus or other factors. We will also need to incorporate the values, priorities, and science of our partners into the tool.

The tool cannot be all things to all organizations. There is a risk of trying to take on too much or trying to be overly general because too many people want too many different things. This could lead to having too many pieces and too many questions, while missing the important questions. We need to determine what local government planners want to get out of the tool, what information they are looking for, and what level of accuracy and confidence is needed. The project may need to be scaled down to address more specific responses, issues, and needs. A well-defined, tangible, and achievable initial product will

need to come out of the scoping process that will be helpful for jurisdictions to answer specific questions. Stakeholders have suggested starting with the low hanging fruit (i.e. easier analysis) to show the value of the tool. This could be where data are already available but have not been tied together to show trends. Then the more complicated analysis and data collection (i.e. where there might be data gaps that need to be filled or more complexity in modeling) could be done after the value of the tool is proven. However, the scope may need to ultimately be broadened beyond critical areas to truly encompass a jurisdiction's needs under the GMA.

The tool should include a decision framework to guide the use of information at the appropriate scales. This framework should contain a common denominator set of questions that all users need to ask. Without a decision framework, there is a risk of developing a collection of too much information that local governments will have a hard time sorting through and applying correctly. The decisions that the tool will support need to be clearly defined and stated before beginning tool development. This will allow us to focus on the right questions, data, and analysis to include.

4.2 Data and Model Inclusion

Analysis is only as good as the data basis. Forty six percent of survey respondents who had experience using decision support tools said that data not being accurate enough was one of their biggest challenges. There is a risk of not having all the necessary data, or finding out during tool development that we do not have all the data we think we have. Thirty four percent of survey respondents who had experience with decision support tools said not having enough data to make the decision was one of their biggest challenges. Some datasets are appropriate for regional questions while other datasets are appropriate for parcel level questions. There are also some already known gaps in datasets available for things that would be desired components of the tool, such as city and county jurisdictions' regulations and restrictions with regard to critical area and shoreline setbacks. Including this information would require additional code research and development of datasets. There is also a risk of getting 99 percent of the way there and realizing something critical was missed, and having to go to an outside source to get that one piece of information. This will need to be addressed through careful planning and research before and during tool development, as well as by developing the tool in such a way that additional data sources and linkages can be added in later. The project and budget should include analysis of data and integration throughout the project development and for ongoing updates and maintenance.

Data coverage will not be equal across the region, and uncertainty in unmapped areas will need to be communicated. For example, a

Potential Scoping Challenges

- Engaging appropriate range of stakeholders
- Shifting priorities during development
- Too many people wanting too many different things
- Missing important questions
- Well-defined, tangible, and achievable initial product
- Decision framework to guide use of information at appropriate scales

Data & Model Challenges

- Data accuracy
- Necessary data unavailable
- Datasets appropriate at different scales
- Unequal data coverage
- Uncertainty
- Differences between regulations and actual land use
- Validating assumptions & models
- Providing clear definitions
- Using best & most up to date data
- Understanding interactions between datasets and response variables
- Minimizing errors
- Transparency about limitations

natural hazard may be identified in some locations, but that does not necessarily mean that all other places do not have hazards. The tool will need to identify where there is certainty of knowledge and where there is less certainty, and be able to show where the uncertainty is. This could be done by greying out unmapped areas and flagging unmapped areas where information should be collected, or by dialog or pop up information for specific locations. This would allow the user to understand where data is not yet available and may encourage the collection of some of that additional information.

Additionally, there may be differences between what is protected in the code and what is actually occurring on the ground, whether that is due to exceptions, variances, illegal building or clearing in critical areas, or other factors. Some of these activities may be permitted and others may not. There is a range among counties and local governments on how well they are implementing critical areas ordinances. If models are based on the critical areas ordinances as they are written, there is a risk that some areas might be shown as a buffer in the tool, but there may still be activities occurring in that buffer that affect other variables. Special circumstances or underlying permit factors may be affecting what is displayed on a larger landscape or county wide map. Whether the models reflect reality or code will need to be defined, as will other assumptions inherent in the models. Assumptions around the relationships between, for example, expanding buffers (land use) and water quality or other response metrics which are realized outside of the actual buffer (i.e. hydrology, fish, etc) will need to be validated or documented in order for the scenarios to have value for decision-making. The tool itself will need to properly differentiate between science and policy.

For datasets that are defined by varying policies or definitions, we need to make sure the user knows which definition they are looking at. For example, definitions of impervious can vary by jurisdiction and by code. Even within the same jurisdiction, the definition under the zoning ordinance may be different from the stormwater definition. It needs to be clear what definition is being used and where it came from. This can be done through metadata and more explicitly for each dataset in the tool, and users will have the option to upload their own datasets if they want to use a different definition.

We also need to make sure the tool uses the best and most up to date data available. This can be partially achieved through data sharing methods where datasets are maintained and updated by the originating agencies and organizations according to their own update schedules. However, we will need to ensure that those agencies continue to maintain and update their data, and that it remains compatible with the tool. We can also allow users of the tool to share and use their own datasets if they have a better or more up to date data source for their jurisdiction. All layers in the tool should be named intuitively, cited and dated, and have robust metadata, as well as contact information for the developers of the data for further questions. A survey respondent suggested replacing outdated layers rather than simply adding new ones.

There is also a risk of not fully understanding the interactions between datasets and response variables. Thirty eight percent of survey respondents who had experience developing decision support tools experienced significant challenges with linking multiple models and datasets together to analyze scenarios. There are many confounding factors that may make it difficult to understand the relationships between inputs and outputs needed to run the models. Another survey respondent with experience developing decision support tools said that even when they had the resources to get the needed data and build a model, they have not had the resources to thoroughly validate the model.

We need to acknowledge that no tool is ever going to be perfect. As with most scientific models, there is a risk of Type II error (or a false negative conclusion showing that there is no effect or change when there really is). There is also a risk of Type I error (or a false positive conclusion showing a change or effect when there really is none). The tool and its models should build in mechanisms to minimize the risk of these types of errors and show when they might occur where possible. The tool will also need to be transparent about its limitations, and the limitations of all datasets included.

4.3 Use of the Tool

The target end user and their needs and desires for the tool will need to be clearly defined as a business case. We will need to assess how using the tool will result in better decisions, and there is a risk that profit-driven decisions may prevail over Growth Management Act and best available science driven decisions despite development of the tool. One challenge expressed by a survey respondent who had experience with decision support tools was that tool outputs cannot always be easily applied to the decision that needs to be made. This could be addressed through building a structured decision making framework into the tool.

Even among local planners, there are likely to be user differences. Planners in metropolitan areas and resource-minded organizations will be most likely to use the predictive functions of the tool. Other planners will need very fundamental information on what critical areas are and where they are located. Some jurisdictions do not have experts or people who use the available maps and tools for critical areas planning, and some planners still do not know what or where the critical areas are in their jurisdictions. Those users will be using the tool as more of a look up type resource. The tool will need to include an easy interface for users who have no GIS experience to engage with, but will still need to be rigorous enough to add value for those who have more expertise. Data visualization will also need to be taken into account. For both types of planners, the tool needs to be quick and easy to use. Thirty four percent of survey respondents who had experience with decision support tools said difficulty of use and lack of training were some of their biggest challenges. Planners will not use a tool if it takes too long or is too difficult to use. This issue will need to be addressed through developing a user-friendly interface and training resources.

The potential for citizen use of the tool could be complicated and risky. We have received a range of opinions on whether or not this tool should be made available to the public, and what controls on access and use should be built in. There is much concern about how hard it will be to explain the tool and its appropriate uses to the general public, and that this may not be the best tool for citizen science. However, there is also a risk that lack of transparency might heighten distrust of government, and that a lack of public knowledge and understanding of critical areas issues will ultimately work against protection goals. With proper training and explanation of the standards and requirements that need to be followed for critical areas protection, the tool could be a very effective way to allow the public to go in and see how hard it really is to make land use decisions that balance all the competing goals. More thought is needed to carefully consider the implications of public use of the tool and strategize how to address the risks identified. Some possibilities include limiting public use of the tool to a controlled

Tool Use Challenges

- Target end user needs and desires
- Applying outputs to decisions
- User differences between small and large jurisdictions
- Ease and speed of use
- Training programs & materials
- Risks of public use of the tool
- Misuse of the tool and misinterpretation of results
- Keeping analysis at appropriate scale
- Local adoption & buy-in

environment during comprehensive planning meetings, building bumpers into the tool to limit use to appropriate analyses based on scale, best available science, and other factors, blurring or shading out answers when the scale changes, developing an access login to share data and use the tool, providing public training programs, or simply developing written disclaimers with well-developed terms of use conditions as are seen in most agency web maps and tools.

Whether it is used by the public, or only by local governments, agencies, and other organizations, there is a risk of misuse. Forty two percent of survey respondents who had experience using or developing decision support tools said that users not understanding how to interpret or use the data was one of their biggest challenges. There is concern that planners often do not always understand all the data they are provided or how it should or should not be used. Some data is appropriate for regional questions and other data is more appropriate for parcel level questions. It will be critical to ensure users understand the data that is included in the tool and its appropriate use, as well as what the tool does and does not do. Many analyses would need to be kept at the appropriate scale (for making watershed or sub-basin level decisions) so that they cannot be misused to justify site specific development or changes in critical area protections. Otherwise people may try to use the tool inappropriately at the property level. Bumpers and bounding ranges could be programmed into the tool to prevent this type of misuse. If a person wants to move a critical area buffer on their property, the tool should apply that change at a threshold where effects can be seen (i.e. the sub-watershed scale), so the person is not misled into thinking the tool can predict effects at the site level. A related risk is that not all potential users of the tool will understand technical jargon. Consideration will need to be given to how best to simplify the tool to make it accessible, without simplifying it too much. A Puget Sound wide training program should also be developed for the tool, both for the public and for local governments.

Depending on how the tool is designed, there is a risk that it could be used to rationalize buffers that are narrower than best available science dictates. Bumpers and bounding ranges could ensure the values that can be explored in the tool (for buffer sizes and other measures) are consistent on best available science. If implemented in this way, this could provide the additional benefit of ensuring that best available science is incorporated during critical areas updates. If the tool itself becomes best available science, there is a risk that the Hearings Board will not see it that way. They will need to be brought into the fold on this project at some point as well.

The other major risk related to use of the tool is that there will be a lack of local adoption and buy in. It may be challenging to get everyone to agree to support and use the tool. Thirty eight percent of survey respondents who had experience with decision support tools said lack of organizational support for using the tool to make decisions was one of their biggest challenges, 14 percent had issues with lack of buy in from target users, and 34% had experienced difficulty with other people not liking or believing the results. There is concern that local governments will not want or trust a tool coming from the state level with federal funding. Most survey respondents were very receptive to the idea of the tool, but a few did express this sentiment. One survey respondent expressed concern that the tool could lead to reducing local control over implementation of the GMA and SMA. Many previously-developed planning tools have been deemed inappropriate or inapplicable by local jurisdictions because the scale of the data used is too coarse or not accurate enough. In order for development of the tool to be worthwhile, it will need to be used and relied upon by local governments to inform GMA/SMA decisions. Allowing local governments to use their own data within the framework of the tool if they wish to would be a way to help ensure that the tool can meet the needs of local governments. The tool will also need to provide

transparency about the accuracy and confidence in the information. Another way to promote use of the tool by local governments would be to develop it in a way that provides safe harbor and assurances that if they use the tool they did their work right. Good outreach will be needed to tell decision makers how the tool will make their jobs easier and we will need to solicit and respond to feedback throughout the development process.

4.4 Developing the Tool

Successful development of the tool will depend primarily on getting enough funding. We currently have only secured the first year of funding to scope and begin to design the tool, and there is a risk attached whether that funding continues. Tool development is likely to be expensive, and the cost will likely exceed the original amount requested in our NTA. After we determine the features to be included in the tool, we will need to produce a more accurate estimate of the cost for developing it. Designing the tool to be implemented in phases could also help if we are unable to immediately get funding for full buildout. Seeing the utility of new developments at each phase could encourage funders to provide money for additions. However, starting with smaller pieces and maintaining uncertainty about future funding might reduce interest in the project from potential contractors. We will need to pursue additional funding sources, potentially through NTAs and from the legislature.

Finding the right software packages and co-opting them for our purposes could also help keep development costs down. We have identified and reviewed several software packages for decision support tools that have already been developed with millions of dollars of investment, and we will need to assess the feasibility of incorporating those frameworks into our tool. This will help prevent us from trying to reinvent the wheel.

Other software-related challenges may be related to database interoperability and securing enough processing power to operate the tool efficiently. There may be challenges with data integration and getting maps, models, and other datasets to link and be able to talk to each other effectively. Automation should not be programmed until the workflow is proven. Processing power could be gained by using cloud computing services (i.e. AWS or Azure), or through services offered by ESRI. All software used in the tool will need to be compatible with state standards and standard technology at the state (i.e. ESRI and SQL Server).

Permissions for using data also vary by agency and may be inconsistent between jurisdictions. If we only use open data, it can be viewable for all users. However, some users will likely want to use more confidential categories of data, and accommodating this would require a security component that only grants access to secure datasets to certain users. The tool will need to be able to handle cases where certain datasets are not available to all users.

Another risk is that IT could drastically change within the 3 to 5 years that it will take to develop and implement the tool. We currently have a gap in IT knowledge on how to implement this tool and will need to get their input on the project. We are bringing Commerce's IT department into the loop and will soon have a dedicated agency GIS coordinator who can provide assistance. The state GIS coordinator

Tool Development Challenges

- Securing funding
- Phasing implementation
- Adapting existing software
- Database interoperability
- Processing power
- Compatibility with state IT standards
- Data security
- Future IT developments
- Contractor availability & interest

and Office of the Chief Information Officer (OCIO) will be able to help with this as well. The tool should build in flexibility to take advantage of new tools and IT developments.

Finally, there is a risk of not being able to find a contractor who can do the programming to develop the tool. We plan to put out a Request for Information to identify additional contractors who would be interested and capable, to ensure that a sufficient applicant pool exists.

4.5 Maintaining and Updating the Tool

The tool and the data it relies upon will need to be sustainable. Data should be shared and maintained on a common platform. Allowing agencies and organizations to share their data with the tool rather than uploading it would make it available and allow those organizations to easily update and maintain their own data as needed. Many organizations already follow a schedule for updating their data and maps, but we may need to find ways to ensure that other datasets are updated frequently enough to be useful in the tool, and that updated versions remain compatible with it. Keeping data links up to date was the biggest challenge expressed by survey respondents who had experience with decision support tools (50% of respondents experienced this challenge). Using the state open data sharing platform would help make sure authoritative data is available and used, and we plan to work with the OCIO Geospatial Program Office to reuse what the state is currently developing in a data sharing platform for this tool.

Data included in the tool will need to include a service date or expiration date, and information on when the last update occurred. We will also need to consider succession planning and how to solve problems with broken links and turnover with agencies that produce the data. The tool will need a way to handle cases when data is not available.

Maintenance Challenges

- Common platform for data sharing & maintenance
- Data update frequency
- Succession planning
- Problems with broken links
- Turnover with agencies that produce data
- Identifying owner & maintainer of platform after development
- Securing long-term funding for maintenance and updates

Even if the data can be self-maintained, the platform will need an owner who can update the tool itself. One survey respondent with experience developing decision support tools said that frequent web browser and other software updates make ongoing platform maintenance a time and resource issue. We are currently discussing four years of potential funding, and what happens in year 5 is not yet known. There is a risk that there will be no owner or maintainer at the end of the NTA. We will need to assess internal support for owning the tool at Commerce and at partner agencies. Long-term funding and a committed long-term steward will be needed for repairs, maintenance, and updates to the tool.

There will need to be capacity to update and expand the tool based on what works and what does not work along the way. Machine learning or AI could be used to gather analytics from the users of the tool to see the most commonly asked questions, most commonly used data, and other information. This would allow us to supplement the information in the tool based on what questions cannot be asked because of data availability, and take out the things that people do not use. It will likely be best to start small but leave room for all of the other things to be added in later. However, there is also concern about the potential to take on too much technical debt.

4.6 Next Steps for Addressing Barriers for the Tool

We will further address the risks and barriers for the tool in our prospectus for tool development. We will hold a more technical discussion of solutions to these problems at our next advisory meeting. We are also researching similar products and tools, to see what tools are available and how they may be incorporated. Developers of other tools may have useful information on addressing the risks and barriers that they have encountered in their experiences.

5. Next Steps

We presented the results of our research at the February 11, 2020 advisory meeting, and discussed how we might be able to meet the needs and priorities identified, how we could use existing data and models, how we could adapt other tools to fit this context, and how we could address and overcome the potential barriers and risks. We are using the information gained from this meeting, individual interviews with others, and our surveys and research to draft a prospectus for tool development that outlines a conceptual design for the tool and a plan for implementation.