This manual produced by

Rural Community Assistance Corporation
3120 Freeboard Dr., Suite 201
West Sacramento, CA 95691
916/447-2854
www.rcac.org

An Introductory Guide to

Developing Water and Wastewater Projects in Small Communities

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Introduction

Many small communities in the Pacific Northwest are facing an infrastructure crisis. Water pipes are cracked and leaking; tanks need to be painted; and pumps need to be replaced. Wastewater plants must be upgraded to provide higher levels of treatment. Many factors have contributed to this situation, including lack of resources, years of neglect, recent growth and stricter regulations. Regardless of cause, these problems are real and small communities must decide what to do next.

Rural areas are also struggling economically. The need to diversify economies and protect environmental quality increases pressure to upgrade water and wastewater infrastructure. In the race to revitalize, rural communities that make investments in infrastructure will be more likely to succeed. But accomplishing this is not easy. Unemployment, departing businesses and changes in public assistance have made it harder to pay for improvements. The public is skeptical about massive development projects. Local decision-makers sometimes disagree with regulators regarding perceived problems and proposed solutions. And sometimes, when faced with difficult problems without clear solutions, community decision-makers become paralyzed by the uncertainty, and opportunities for progress can be lost.

This guidebook is designed for those who have little infrastructure development experience. It explains the first steps communities can take to gain control of the infrastructure development process. Elected officials, clerk-treasurers, public works staff and consultants will find this information useful. It is based on the idea that by getting to know the process, communities can make the biggest difference in infrastructure development long before construction starts.

Infrastructure development

Often, small communities improve infrastructure only when a crisis takes place. For instance, a regulatory agency could take major enforcement action against the community, a local industry could threaten to leave, or a regulation might change. Regardless of the cause, the community usually will have to complete a similar set of tasks. Typically, infrastructure projects follow a three-phase process: planning, pre-construction and construction. Planning tasks include identifying existing needs; forecasting future demand; developing preliminary design criteria; identifying alternative solutions; conducting a financial feasibility analysis; and estimating probable costs. One planning document may identify many separate projects within a system

that need to be done. Pre-construction tasks include design; engineering; permitting; preparing bid documents; acquiring sites, right-of-ways and easements; assessing environmental impacts; developing a financing strategy; and preparing an implementation schedule. Construction tasks include constructing facilities (including labor, materials, inspection and insurance); taking care of contingencies and change orders; and accepting the final facilities.

Many problems encountered in developing infrastructure occur before the construction phase. These problems may stem from a lack of local experience regarding the infrastructure development process or from a lack of community involvement. Frequently, the consultant scopes out the problem, suggests alternatives and implements the chosen option. Then, the consultant manages the pre-construction, permitting and financing. By the time construction commences, most communities rely heavily on the construction manager and inspector to run the day-to-day facilities construction.[1] Where is the community's voice in this scenario? Realize that the community can provide valuable input that will benefit the project before a set course has been committed to.

The easiest way to combat inexperience is to be actively involved in the infrastructure development process. This guide concentrates on the first two phases of activities. First, we discuss how small communities can take an active role in the planning phase; then we describe the pre-construction phase, including a review of project financing. Examples of infrastructure development pitfalls and suggestions for improving the process are highlighted throughout the guide.

[1] In some cases, community members are heavily involved in construction (such as, through a Small Towns Environment Program or Self-Help program).

Part One: The planning process

It starts with better communication

Traditionally, when a community needs planning it hires a consultant to prepare the necessary documents. Once the contract is signed, the consultant spends a few months in the office and comes back with a large, detailed document — the "plan." But what if that plan meets the needs of the residents, but neglects commercial or industrial needs? Or maybe the need to get a regulatory agency to accept the plan means overlooking new, alternative technologies. Perhaps the goal of keeping costs down influenced the consultant's decision-making too much. Conversely, it may not take into account what the community actually can afford. When these things happen, communities feel they didn't get what they want and consultants feel they didn't have enough direction to adequately meet their client's needs. The net result: frustration for both parties.

Know the lingo

Infrastructure improvement projects are classified in terms of the three "R"s: repair, rehabilitation and replacement. Repair corrects a minor problem to maintain the existing structure. Rehabilitation improves the existing structure or restores it to its original condition. Replacing major components is considered part of rehabilitation. Replacement involves demolishing an existing facility and constructing a new and improved one.

A properly maintained system will include some annual repair or rehabilitation expenses in its annual operating budget. These investments will help ensure that facilities last as long as possible. When a system or facility has not been adequately maintained, or when a community's needs change (due to a population increase, the introduction of a new technology or a new regulation), replacement may be necessary.

Replacement should be part of the capital improvement plan and be funded through the budget. Communities should calculate the cost of such improvements and make smaller, annual contributions to a reserve fund each year to build up reserves for expenses over the life of the facility.

Are the consulting engineers to blame? No. Sure, they sometimes get lost in the jargon and fail to explain technical issues clearly enough for non-engineers to understand. But most consultants are very thorough and will be sensitive to community needs. Many will go out of their way to keep clients informed and aware of what is going on. They welcome opportunities for input and discussion.

Is the community to blame? Again, no! Sometimes local decision-makers don't read the plans they paid for. But in all fairness, most council members, commissioners and board members don't have training in infrastructure development and might have trouble understanding the plan. (That's why they hired the consultant!)

The answer is that both sides — consultants and the community — need to work together. Engineers must understand what issues are most important to a community (such as, life expectancy of the facilities, annual operation and maintenance costs or upfront investment). Communities need to express their expectations early and stay with the process to ensure that agreed upon expectations are met. Engineers must be realistic about what designs will work and will be affordable to the community. Communities need to provide engineers with as much information as possible about the long-term development of the community (such as housing, community facilities, and new or expanding businesses). Consultants need to explain options clearly, and communities must ask questions if they don't understand.

Define problems, goals and expectations

Improved communication must start at the beginning of the project, before the financing is lined up, before the engineer has started writing the improvement plan, even before the engineer is selected.[2] The best chance a community has to control the project is at the beginning of the process. It is here that the community defines what problem it is trying to solve, its expectations, measures for success and issues the engineer should address.

When engineers collect data, determine design criteria and evaluate alternatives, they look to the community's goals to guide the process. If the community does not provide clear direction, the consultant may not understand local needs and priorities, and by default, may consider regulatory compliance the only goal. This line of thought can lead to shortsighted or unrealistic solutions.

For example, consider a community whose wastewater treatment plant is out of compliance. Hiring an engineer to just "get the plant into compliance" is ignoring long-term development and growth potential in the community and the possibility for future changes in regulations. Even asking the engineer to "improve the system to accommodate growth" is not being specific enough about what the growth expectations or development plans are.

The community should also consider how an individual project fits with the long-term goals of the community. Later, when it is time to finance the design and construction, the community will present a more compelling case to funding programs. Begin by creating a problem statement or by listing problems the community is trying to solve. The list should not propose specific solutions, because this may place unnecessary constraints on the engineer who is proposing solutions.

[2] For more information on selecting a consultant, see Rural Community Assistance Corporation's (RCAC) *A Guide to Selecting the Best Consultants for Your Community*. Contact RCAC at 916/447-2854.

Similarly, a community should consider existing demands and future needs. A community that only plans to meet the demands of its present users will stifle future development opportunities. The consultants will need to define what those future needs are (based on what the community tells them) to develop thoughtful solutions. Sometimes the information will come from state or county government's population projections. Other times, a community will use its past growth rate as a guideline. However, because growth in the community will also include the changing needs of businesses (both existing and new) and community facilities/services (such as schools, fire departments, community centers and hospitals), communities and their consultants must look beyond simple growth projections.

Therefore, it is crucial that the community clearly state its vision and long-term goals. How would the community like to see itself in five and ten years? If a community wants to retain its small rural character with a few local services, perhaps a wastewater treatment plant with excess capacity is unnecessary. If a community wants to diversify its economy and maintain its role as a rural center or regional hub, it should have some amount of excess capacity available. Revisit any existing planning documents the county or region may have (comprehensive plan, community action plan, master plan, growth management plan, etc.). Look to these plans for guidance and to make sure the proposed system will be consistent with proposed development patterns and identified land uses.

Does the community want the engineers to research non-traditional or alternative tech-nology, or should it stick with well-established technology? Should the final recommendation be based on best available technology, least initial cost, most automated facilities or lowest annual operation and maintenance cost?

The community and the consultants will use the problem statement and the community's vision and local priorities to develop clear project expectations. Once established, these expectations can be written in the form of a scope of work. The scope of work will define deliverables, what information to include, and even what the consultant's role will be in communicating with the public.

During the project, both the community and the consultants can mutually agree to adjust the process along the way if expectations are not being met. A community may decide to have more public meetings. The consultants may decide to spend more time on design issues rather than researching alternative technologies. If "success" is well defined in the beginning, the consultants and the community have a greater chance of getting there together.

Involve the community

If success in the infrastructure development process depended only on good communication, those consultants that always had pleasant meetings with their clients would have no trouble at all. The fact is, improving the quantity and quality of communication is only the starting point. There is a popu-

Know your facilities

Evergreen Rural Water of Washington and the Oregon Association of Water Utilities provide assistance to operators on troubleshooting and improving facilities' performance. These affiliates of the National Rural Water Association can help advise communities about existing facilities and how they can be improved. To contact Evergreen Rural Water of Washington, call 509/962-6326. To contact Oregon Association of Water Utilities, call 503/873-8353.

lar saying: "If you tell me, I will forget. If you show me, I may remember. If you involve me, I will understand." To truly help people understand their role and the issues, involve the community in the process. This means educating the community about basic development issues and actively pursuing community participation. It means showing citizens firsthand the current state of the community's infrastructure, helping them understand how the situation came to be, and explaining options for addressing the problems. To assure that information is provided to the public, state and federal funding agencies *require* a community to advertise and hold open meetings (public hearings) as part of the development process.

Learn about infrastructure issues

Let's face it; very few people are taught in school or learn from their parents about infrastructure development. For most, it is a mess of technical terms and regulations that does little more than confuse even the brightest of citizens. Fortunately, there are educational resources available regarding water and wastewater system development. Local decision-makers can attend training sessions, such as those offered by the National Environmental Training Center for Small Communities (NETCSC)[3] or other nonprofit technical assistance providers such as Rural Community Assistance Corporation (RCAC).[4] In addition to training sessions, both these and state and federal government agencies offer publications on infrastructure development.

Learning about infrastructure also should be grounded in the community's present situation. Become familiar with the existing facilities. Take a tour of the facilities with the water operator or public works director. Listen and then ask questions. Feel free to take notes, and read the correspondence from regulatory agencies. Understand what works and doesn't work with the existing facilities and how preventive maintenance is funded. Review the actual budget amounts from the past few years and the rate structure. Has the system been charging enough to cover expenses?

Working with a consultant

Engineers spend a lot of time — in the beginning and throughout a project — learning about the community, gathering data and distilling technical information into usable plans and reports. This is in addition to the actual engineering work — developing design criteria and selecting technologies. Unlike in big cities, rural community decision-makers and interested citizens can play a large role in helping the engineer focus on issues that are most important to the community.

Community members, staff and elected officials also can take an active role in gathering data and doing basic planning work. Doing so will increase general knowledge of the planning issues, raise issues that might not have been addressed and free the engineer to work on other activities. In most planning processes, engineers determine existing needs and future demand, develop preliminary design criteria, research possible solutions, analyze financial feasibility and develop supporting documentation. In completing these tasks and in evaluating the final product, there is room for the community to be a partner. Consider assigning

[3] NETCSC is based at West Virginia University. As a resource center and information clearinghouse, it provides information on a variety of environmental management topics including solid waste, water and wastewater. Contact NETCSC at 800/624-8301.

[4] RCAC is a nonprofit, technical assistance and training organization that works throughout the Western states helping small communities in a variety of development arenas, including water and wastewater. Contact RCAC's Washington Field Office at 360/493-2260. Contact RCAC's Oregon Field Office at 503/228-1459.

some portion of the information gathering tasks discussed below to volunteer subcommittees. This will distribute the task workload and encourage greater citizen involvement.

Determine existing needs and future demand

To check whether existing facilities are meeting current needs, look at system operation records. Are wastewater discharges within the permit limits? Does the amount of water pumped at the well correspond closely to customer service meter totals? Naturally, this means that the community must keep and provide good records, such as laboratory analyses and maintenance logs. It also means collecting correspondence from regulatory agencies, as well as documenting customer complaints and any building permit denials.

Community members don't have to become librarians or scientists to take a role in researching infrastructure data. If local information is incomplete, consultants may have to perform their own tests or find data from other, similar communities. Using local volunteers and public works staff to research and assemble basic information can reduce the amount of the consultant's research time, and ultimately, the cost to the community.

From the consultant's perspective, it is difficult to know what new housing or industry developments may be on the horizon without living in the community. Most engineers do only basic research to determine what future demand for facilities will be. Local community members can help refine estimates of future demand by providing the engineer with specific information.

For example, an engineer might assume that the town would grow at about the same rate it has for the past few years. Instead, a community could say, "Over the next three years, the wastewater treatment needs will include 410 citizens, two restaurants, one gas station and about 20 new single-family homes and three new small businesses." The more specific the details, the better the consultants can respond.

Where does the community obtain the information needed to make such specific statements? First, look at county and local growth management plans (if they apply), or the economic development plan for your county or region. Next, look to local business owners, chambers of commerce and local economic development councils to help define what the changing needs of local businesses might be. Then search for a housing plan from the local housing authority. Other good sources include the strategic plans of local nonprofit development organizations and even the proposed projects of local and state agencies. Other system records, such as past engineering reports, feasibility studies, previous system designs and technical staff (such as, operators, public works staff and city planners) can all provide valuable information regarding current and future needs.

Ask the right questions

When considering new residential, commercial and community facilities (library, senior center, recreation facility) discuss the following questions with the developer and the engineer:

- What will the demand on the water system be?
- Does the well produce enough water?
- Does the community need a larger reservoir?
- What amount and type of wastewater will it generate?
- Can the wastewater treatment facility handle that loading?
- Does the wastewater plant need another treatment stage?
- Does a better access road need to be built?

- How many heavily loaded vehicles will use the access road?
- Can the access road accommodate that much more weight?
- Will the improvements reduce vehicle traffic in another part of town?
- How will the development affect stormwater runoff?
- Will the existing stormwater system be overwhelmed by runoff created by the new development?
- Will stormwater retention ponds be needed?
- Will the improvements protect downhill properties from stormwater runoff?
- How much will the improvements cost? $20,000? $200,000? $2 million?
- Who will pay for the improvements?
- Will the new development pay for the improvements?
- Should existing residents and the new business share the costs?
- Will the improvements benefit existing customers at all?
- Can the costs be spread only among commercial or industrial users?
- Does the cost of the improvements outweigh the benefits?

Many communities do not plan for growth and have to answer these questions each time they are confronted with new development. Some communities will allow development up until their facilities have no more capacity. This may soon be followed by a moratorium on further connections to the water or wastewater systems, which may cripple future development plans. A community that plans ahead will anticipate what kind of growth will take place and answer these questions in the planning phase.

How much a community grows depends on how much excess infrastructure capacity it has, how efficiently it uses the existing capacity, and the size of its planned growth area. Consultants usually will create a basic facility design to meet the needs of existing users, then expand the design to accommodate a small amount of growth. This is often

Planning for growth

Growth is not a choice for most communities. The choice is in how a community will deal with growth. Both Washington and Oregon have well-defined land use planning laws that give local leaders the ability to manage growth, specifically in infrastructure.

According to provisions of Oregon's Land Use Program, cities and counties are required to adopt comprehensive plans and ordinances that are consistent with statewide planning goals. The goal of the public facilities requirements is that public services should be planned in accordance with a community's needs rather than be forced to respond to development as it occurs.

In Washington, the Growth Management Act has similar requirements for planning, called *concurrency* requirements. This means that facilities must maintain a set standard (a basic "level of service") and serve a new development no later than when impacts of the new development arise.

called "including some excess capacity" in the facility. The amount of excess capacity can be measured in different ways. Here are two examples:

- Excess quantity (example: accommodate production of 5,000 more gallons of water per day)
- Excess quality or "strength" (example: accommodate 10 more pounds of biochemical oxygen demand per day entering the wastewater treatment facility)

Building excess capacity into facilities may require larger distribution or collection pipes, more durable materials or even more advanced technology. Such improvements may provide excess capacity of 10 percent, 20 percent or more beyond the needs of existing users. Many engineers will design 10 percent or 15 percent excess capacity into facilities as standard practice, and many government funding programs will finance 10 percent excess capacity without much extra scrutiny. However, excess capacity beyond 10 percent may not be eligible for financing from some programs. Therefore, it is important to know how much excess capacity has been designed into the system and how costly that excess capacity will be.

Forces outside the community also will shape a community's infrastructure development plans. Both the federal Safe Drinking Water Act and Clean Water Act are constantly updated as science improves and more information becomes available. Various regulations have forced communities to install or improve their water treatment. Studies of certain stretches of rivers, such as the U. S. Environmental Protection Agency's (EPA) 303(d) list, have put pressure on state regulators to make wastewater discharge permits more restrictive. Lawsuits have forced agencies to concentrate on compliance and enforcement, including the use of fines and penalties. Given this regulatory climate, communities and engineers should plan facilities with an eye toward future regulations. Ask regulatory agencies for their perspective. Take note of Internet postings and newspaper and magazine articles from organizations that specialize in infrastructure (such as the Water Environment Federation and American Water Works Association[5]) to help build an understanding of how regulations may change.

This may seem like too much effort for communities who are under compliance orders from a regulatory agency and need to take quick action. However, if communities do not consider these larger issues, they will invariably find themselves with undersized or inappropriate facilities later on, restricting their access to future development opportunities.

Research possible solutions

For most water and wastewater system problems, there are multiple possible solutions. In planning major improvements — such as, new treatment facilities, major distribution or collection system repairs — the engineer will spend a fair amount of time researching a variety of possible solutions. Unfortunately, this is an area where communities (and sometimes funding agencies) become frustrated with the planning process.

[5] Water Environment Federation (WEF) is a nonprofit technical and educational organization. Its goal is to preserve and enhance the global water environment. Contact WEF at 703/684-2400. American Water Works Association is an international nonprofit scientific and educational society dedicated to the improvement of drinking water quality and supply. Contact the AWWA at 303/794-7711.

Rural Community Assistance Corporation

Rural Community Assistance Corporation (RCAC) is a nonprofit organization that provides a wide range of water and wastewater management and development assistance to small communities throughout the West. RCAC can assist a community in developing a wide range of supporting documentation, including rate studies, financing strategies and service policies. For assistance in Washington, call 360/493-2260; in Oregon, call 503/228-1459.

Often, systems will seek new or "alternative" technology in lieu of traditional treatment options. Usually, this is driven by the desire to reduce costs. However, realize that consultants are obligated to provide clients with options they are sure will work, and they may be hesitant to try unfamiliar alternatives. Moreover, regulatory agencies are very particular and may be reluctant to approve alternative technology solutions. Given these constraints, it becomes crucial to establish a clear scope of work and set of expectations at the beginning of the process. If the community wants the engineer to consider every technology under the sun, it should say so at the beginning of the planning process. More importantly, the community must be prepared to spend the money and time needed to identify and examine alternative technology options.

However, the community can also help research alternative technologies. Start by talking to other neighboring small communities and state regulatory staff to find out if other communities have used non-traditional solutions to the same problems. Talk to those communities to find out how well those systems are performing. Call informational clearinghouses to learn about what other communities in the nation are doing. Both the National Drinking Water Clearinghouse and National Small Flows Clearinghouse have a wealth of information available on alternative technologies used in small communities.[6] Also, the EPA and several state environmental quality agencies are now posting alternative and best available technology information on their Internet sites.

In addition to finding out what technologies exist, give the engineer direction on how to evaluate these technologies. Evaluation criteria can help to provide the engineer with direction along the way, such as: What are the community's priorities for initial cost, annual operation and maintenance costs and operator expertise? How important is local access to parts? If the facilities fail in five years, will the community be satisfied with having experimented and failed?

Analyze financial feasibility

Community members can gather and analyze local budget and rate information to help the engineer prepare a financial analysis. Again, with the help of well-written guidebooks that are freely available, as well as technical assistance providers that can help analyze and compare the financing and rate scenarios, the community can be an effective partner in minimizing the consultants research time.

Paying for infrastructure is similar to buying a car. Most people can't afford a luxury vehicle, so they

[6] The National Small Flows Clearinghouse (NSFC) is located at West Virginia University (WVU). It provides free and low-cost technical assistance, products and information services regarding small community, onsite wastewater treatment and pollution prevention issues. National Drinking Water Clearinghouse (NDWC), also located at WVU, provides similar services for drinking water issues. To contact NSFC and NDWC call 800/624-8301.

buy something that will meet their needs. If they just accepted the price the dealer offered, they would never know if they could have gotten a better deal. Sometimes, the financing may have so many restrictions that it becomes difficult to accept the terms. When choosing between similar cars, there also are other considerations; better fuel economy may mean lower monthly gas bills, but the car may not handle extreme conditions. A simple car without fancy features may be easy to maintain by someone with a basic understanding of auto mechanics, but a car with many electronic features may require qualified personnel to work on it. Finally, the cost of making so many visits to the auto mechanic over time may not be worth the initial savings.

Like a car, infrastructure has both capital and annual operation and maintenance costs. Capital cost projections usually come from an engineer's estimates from other systems and generally accepted industry estimates. However, communities should not blindly accept these numbers without understanding where they came from. Compare cost estimates with the bids from other local construction projects and budgets from other communities. Sometimes, the engineer may be overly conservative in estimating, and the actual cost of the project will be much lower. However, the opposite could be true. Perhaps the cost of labor or materials in your community might be more than in other areas. In any case, the capital cost projections should be reviewed carefully to prevent surprises.

Most small communities use government loan and grant programs to finance infrastructure improvements. Realizing this, most consultants will include a section in the plan for possible financing scenarios that are based on their knowledge of the funding programs' requirements. The projections might be overly optimistic about what is possible, not what is probable. Look carefully at proposed funding options. Does the funding plan assume the community will receive the maximum grant award possible? Will the community have to obtain the longest-term, lowest interest rate loan to be affordable? Will the project have to demonstrate that economic development will result from the project to qualify for the financing?

Asking the right questions implies that the community has investigated financing options thoroughly. State and federal agencies publish (in print and online) detailed fact sheets on their funding programs, including contact information, requirements and eligibility. Also, most funding program staff are glad to talk to communities about project ideas. Learn about the different funding programs to fully understand the consultant's recommendations on financing. Don't hesitate to call a funding agency if there are any unclear issues.

Project resources are available

In Oregon, Oregon Rural Community Assistance Program (ORCAP) has created a matrix that identifies agencies that provide financing and technical assistance for small community water and wastewater projects in Oregon. It lists options by type of project with contact information, including name, agency, telephone number and electronic mail. Contact ORCAP at 541/682-4062.

In Washington, the Infrastructure Assistance Coordinating Council (IACC) has created the *Infrastructure Assistance Directory* that provides program and contact information for resources available to communities in Washington. Contact the IACC at 360/ 725-5002 for a copy.

Infrastructure projects are very expensive, especially when compared to the overall budgets of small communities. But the upfront costs of a project are only part of the financial picture. After facilities are constructed, the rates paid by users must cover the cost of annual operation and maintenance in addition to loan repayment and establishing reserve funds. When making a recommendation among several proposed solutions, look at what makes the most financial sense for the community.

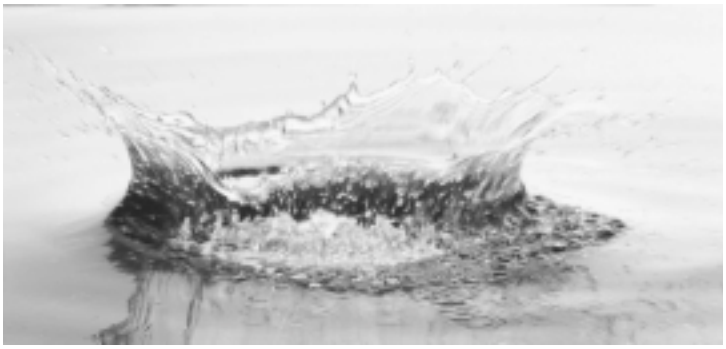
Perhaps the cheapest option to construct may require a lot of the operator's time to operate and maintain. Also, a less expensive facility may not last as long, or may require so many improvements and upgrades that there are no real cost savings over time. On the other hand, a technologically complex system can be more costly to build and might require a more qualified operator to run it. But it could require less staff time to operate and be trouble free for a longer period of time. The consultant's recommendations must be closely scrutinized to be sure that they are aligned with community needs.

Clearly, the interests of the community are best served by considering the total life-cycle cost of the facilities. Infrastructure facilities may last a long time, but they don't last forever. If a community fails to perform preventive maintenance, system life expectancy will suffer. However, even with proper maintenance, some components will have to be repaired or replaced regularly. The total cost of these improvements over time must be included to create a complete financing picture.

Develop supporting documentation

Most regulatory agencies require that project plans have some supporting elements, such as, operation and maintenance plans, wellhead protection plans, rate studies and service area policies. In many cases, the community will ask the engineer to complete these documents as part of the scope of work, even though most of these plans do not require engineering skills. Therefore, communities are paying engineers to do non-engineering work!

Some of these supporting documents may already exist locally or regionally. If they do, collect them and make them available to the engineer. If they do not exist, it makes sense for a community to look at which documents it can help complete. Local staff (public works, clerk-treasurers and administrative), community members and elected officials can use publications and technical assistance providers to their advantage. Rather than having an engineer develop service policies, go back through the community's own planning documents, ordinances, resolutions and plans (or ask neighboring communities for their documents) and develop service area policies that are tailored to meet local needs. For example, instead of paying the engineer to write the operation and maintenance plan alone, have the community's own operator work with the engineer and a technical assistance organization to write the plan jointly. There also are instructional guides and fill-in-the-blank worksheets available from nonprofit groups, clearinghouses and regulatory agencies and the Internet. Nonprofit technical assistance organizations and regulatory technical assistance staff also train and coach community members through the development of supporting documents.



Part Two: Pre-construction Activities

Up to this point, this guide has discussed how improving the planning process involves communicating with the consultant, becoming involved in gathering data and evaluating recommendations. Now, the guide covers how to improve the pre-construction process by matching local resources with pre-construction activities, such as design and engineering, environmental assessment, permitting and financing.

Design and engineering

Once a water or wastewater system plan is complete, it must be translated into a physical, workable design. Like preparing the plan itself, this task usually falls to an engineer. Unlike preparing a plan, though, there is very little that non-engineers can do to bring the cost of design down. Selecting a quality consultant is where the community will likely get the most reward for its effort during the pre-construction process. Realize that pre-construction is more than just "crunching numbers and creating drawings." Good consultants will thoughtfully consider the problems, design sound solutions, and utilize their experience to the community's advantage.

Often, the design engineer will be the same engineer who created the plan. There are both advantages and disadvantages to this. Picking the same engineer ensures consistency. The same engineer doesn't have to spend time understanding and verifying another engineer's planning work and can instead spend time on the actual design. If the relationship was positive in the planning phase, the community and the engineer can look forward to continued communication and respect. On the other hand, if the relationship was bad, a community may want to look for another engineer. The community also may benefit from talking to other consulting firms to obtain different ideas and perspectives on the planned improvements.

Regardless of whether or not the community picks the same engineer to do both the planning and design work, it absolutely should go through a competitive selection process to ensure fairness to all parties. In most cases, public funding programs and/or state laws require communities to do this. A competitive selection process ensures that the community's choice of consultant is based upon qualifications rather than price alone. And, by forcing engineers to emphasize their skills, knowl-

edge, experience and abilities in their proposals and interviews, a community can see how different engineers might approach the same design problem.

Environmental assessment

Most projects require an assessment of the environmental impacts of the project. If state and/or federal money will be used to finance the project, the community will be required to assess whether the project meets state and/or federal environmental regulations. Some funding agencies require the environmental assessment be completed as part of the planning process. That is, it must be completed *before* the project will even be considered for design and construction funding. Be sure to check with potential funding agencies regarding when the environmental assessment needs to be completed, and if the costs are eligible for funding. Some assessments can be detailed and time consuming, so be prepared to include this item in the project budget.

National Environmental Policy Act

The federal environmental assessment is derived from the National Environmental Policy Act (NEPA). In a NEPA review, the community or its consultant prepares an environmental assessment. The environmental assessment examines such wide ranging issues as air quality, water quality, solid waste management, transportation, noise, historic/archaeological properties, wildlife and endangered species, energy, construction methods and toxic substances. If the review concludes that the project is environmentally significant, it will be required to complete an environmental impact statement (EIS). Projects that are found not to be environmentally significant receive a Finding of No Significant Impact determination.

State Environmental Policy Act

Some states have used NEPA as the basis for creating a state-specific version of the NEPA, or a State Environmental Policy Act (SEPA). Because it is modeled after NEPA, the SEPA environmental review process is usually similar to NEPA, but it may recognize certain state conditions that require more attention.

In some cases, the funding agency will manage its own NEPA environmental review. If more than one federal funding source is involved, several agencies can pool their resources and jointly review the environmental impacts of a project or designate one lead agency. If a SEPA assessment is required for the project, the community usually will submit it as part of the supporting documentation needed for the lead agency to write the project's NEPA assessment.

Environmental Impact Statements

Oregon has not adopted a SEPA, but Washington has. In Washington, non-exempt projects require the community to prepare a SEPA checklist which documents the major environmental impacts on: earth (erosion, soils, fill), air emissions, water quality, plants, animals, energy and natural resources, environmental health, land and shoreline use, housing, aesthetics, light and glare, recreation, historic and cultural preservation, transportation, public services and utilities. If the agency reviewing the checklist determines that the project may have significant environmental impacts, the community may have to prepare a full EIS. An EIS should address how the project will be changed to address possible environmental problems as well as propose mitigation measures that could be taken.

Hazard Mitigation

One of the most overlooked elements in designing new public facilities is the type of natural hazards they will be exposed to. Assessing these hazards and doing something to lessen the potential impacts is called hazard mitigation. Communities must plan for and design facilities to resist the impacts of natural disasters, such as floods and earthquakes. In the long run, the small initial costs associated with building a disaster resistant facility will more than pay for itself by reducing the future costs associated with repairing a facility damaged by a natural disaster. If your community has been impacted by a major disaster, funding programs like the Hazard Mitigation Grant Program may be able to provide assistance.

Again, the community, the consultant or the funding agency may write the actual environmental review documents. With shrinking government resources, the community is often required to complete this task. Of course, as with other planning tasks, many communities may ask their consultant to prepare the project's environmental review documents and submit them to the funding agency. The process involves many steps including: filling out simple forms, requesting comment letters from various state and federal agencies and then ensuring that comments are adequately addressed. While the consultant may be able to accomplish this quickly, community members can critically read the assessment and supporting documents to better understand the project. If it appears there will be few environmental concerns with the project, having the community complete some or all of the environmental assessment will, of course, save the community money. If the community finds itself without local resources, free or inexpensive technical assistance may be available from nonprofit organizations and the funding agencies themselves.

Permitting

Permits are necessary to ensure that projects comply with regulations and are in line with local, regional and federal needs and objectives. Depending on the size and impact of the project, as well as the jurisdiction (such as state, county and/or city) in which the project is located, permitting can be either very straightforward or a complex web of applications, reviews, public notices and negotiations. A community can successfully negotiate the permitting maze by understanding the different kinds of permits that might affect a project, taking advantage of their consultant's prior permitting experience and using state and local permit assistance resources.

Some communities prefer to leave the entire permitting process to their consultant. This is understandable, given how complicated permitting can be. Consultants who have administered or been involved with local construction projects have undoubtedly developed their own methods for shepherding their client's projects through the permit application and review process. The consultant may know exactly what permits to obtain, which permits will take longer to be reviewed and how to modify the construction plan to accommodate the permits. Most importantly, permitting issues can be good indicators for possible future problems. Be aware how the permitting process may affect construction costs (such as a longer schedule), where mitigation measures need to be taken (such as replanting and wetland construction) and where cost overruns might be expected because of permitting (such as reinforcing a building's structure to meet local safety codes).

Many different types of permits are involved in the construction process. As one would expect, construction activity disturbs and could potentially pollute the earth, air and water if it is not controlled. Aesthetically, construction may affect a homeowner's privacy if it means cutting down a stand of trees that shields the property or creating noise disturbance from construction equipment. Waste from the construction site needs to be disposed of properly. Construction around bodies of water needs to be monitored so that it doesn't negatively impact the shoreline, the flow of the water or any of the plants and animals living there.

To learn about all the different kinds of permits is a daunting task. The best approach is to start with permitting publications produced by state and federal agencies. These publications can provide a list of commonly required permits. Because such publications usually will only cover statewide and some typical federal permits, get the local government perspective as well. Counties may publish short fact sheets on what permits might impact a construction project. Talking to neighboring communities (in the same county) that have had construction projects permitted is another option.

Realizing that communities and consultants may want more direction or targeted advice on the permitting process, many state and local governments have set up permitting assistance efforts. They provide staff who work closely with permit issues to clarify and provide advice on how to make the permitting process easy to use. Typically, general consultations and one-on-one services are provided both for a fee and free-of-charge. Some programs even use simple questions on paper or the Internet to lead people through a decision flowchart that indicates what kinds of permits might be required for a given project. These services are valuable for any community trying to manage or just better understand the permitting process.

Financing

Each community will put together a project financing plan to meet its individual needs. Some communities choose to raise user rates, then fund as much of a project as possible out of built-up reserves. Some like to search extensively for grants and ignore loans as a source of funding. For most communities, though, the end result will be a financial package that blends all of these aspects.

As a first step in creating a financing plan look at all the possible sources of funding and then determine if your community is an eligible applicant with an eligible project. After that, prioritize the list according to those programs that give grants, and then the best terms and rates for loan payback. Avoid the "shotgun" approach when applying for funding. It is too time consuming and inefficient to send applications to every possible funding program. Instead, learn more about the funding programs and decide which ones best fit with the community's needs.

Sources of project funding

Common sources of water and wastewater funding in both Washington and Oregon include:

- Water Quality and Drinking Water State Revolving Funds (SRF's)
- U.S. Environmental Protection Agency
- U.S. Department of Agriculture-Rural Utilities Service
- U.S. Department of Agriculture-Forest Service
- U.S. Economic Development Administration

These funding sources are also available for certain infrastructure projects in Washington:

- Centennial Clean Water Fund
- Public Works Trust Fund

These funding sources of funding are also available for certain infrastructure projects in Oregon:

- Special Districts Association of Oregon
- Oregon Economic and Community Development Department
- Oregon Health Division
- Oregon Water Resources Department

Grants and loans

Developing a financing package should not mean applying only for grants. Relying solely on grants is rarely possible due to competition for scarce funding resources and income eligibility requirements.

Even if the chances of getting a grant are good, be realistic. Plan for what will happen if the grant is not received. Create a worst-case scenario for financing your project by using a combination of local revenue, loans, and/or bonds. Calculate the full cost of borrowing and the monthly impacts on user rates since financing system improvements using debt alone may raise the user rates beyond a level the people in the community can afford (this is discussed more later under User Rate Impacts).

Tip

Will the project create jobs? Certain funding programs can fund infrastructure development that is tied directly to growth in the form of economic development activities such as job creation or job retention.

Can businesses receive funding? Businesses have access to financing through sources that are either not available to, or not generally used by, local governments, such as parent company reserves, commercial banks, private bonds and certain government agencies that work with the private sector.

Using this approach will help demonstrate the community's true need for grant funding to complete the project. It is also possible that a grant program may ask the community to reduce the scope and costs of the improvements in order to increase local affordability.

Consolidating pre-construction and construction costs

Many government programs will fund pre-construction activities if they are part of a combined pre-construction/construction package. In this situation, the community takes out debt on both the pre-construction and construction amounts. One drawback to this approach is that NEPA and SEPA environmental review requirements may apply to both pre-construction and construction phases of the project.

Funding excess capacity

Although many government programs do not finance excess capacity for growth, there are a few that can. Those that can will have slightly different definitions of growth, though. If the amount of projected growth is within certain limits, a funder may be able to cover the costs associated with it.

If a community wants to build excess capacity beyond what government programs can fund, it will need to finance that portion on its own. For instance, the community could choose to issue municipal bonds. However, bond buyers may require even more guarantee of payback than some government funding programs. Therefore, municipal bonds may have covenants requiring that a certain portion of repayment will come from new connections and may also include performance measures that demonstrate that these funds can and will be raised. A community might be asked to demonstrate whether new development is probable and realistic, and to create a connection fee schedule for new hook-ups. Such a fee schedule

could include some combination of impact fees, system development charges, or private financing.

Packaging groups of projects

Funding program policies are constantly changing. In the past, many funding programs expected to see just one project per application. Programs increasingly want to see a comprehensive approach to solving problems. Communities are being urged to submit applications that include more than a single project. Although funding program policies will continue to change, it is likely that packages of projects will score well in the selection processes of many funding programs.

Tip

How does the timing of the project fit with other planned infrastructure projects? For example, you wouldn't want to conduct a sewer or water main replacement project following road improvements on the same street. Combining or coordinating the schedules of projects will save time, money and disruption. Failure to coordinate projects is wasteful and can be politically embarrassing.

Different communities have different priorities. For some, the goal is to keep monthly rates to a minimum. Others want to minimize the total repayment amount (principal and interest) or to limit the time period construction work will disrupt their community. From the funder's perspective, it is not always possible to fund a community's project at the full amount requested due to limitations on the amount of money they have available. Funders want to see projects that are affordable for the community and appropriately "phased," meaning that the most important needs or steps are taken care of first.

To save money and effort, some communities will group together several projects and submit an application to fund that entire group. Sometimes a community will be under a compliance order from a regulatory agency to undertake several projects at the same time, which may require an application that covers all those projects. To have several improvements funded, a community can look at packaging projects together. These packages might include:

- Equal priority projects. The package can consist of projects that all need to be completed simultaneously. A community may have four projects on its water system capital improvement plan that should be completed in the first year. Another community may have to meet a regulatory deadline and have two major improvement projects that need to get done by a certain deadline.
- All planning work. Because planning money usually comes from local revenue or zero/low interest loans, putting all planning activities for a particular system together into one package can be useful. However, if local dollars are used to fund planning projects, consider including planning as part of a larger package with pre-construction and construction activities. This way, the local dollars spent on planning can be counted as matching funds for the larger project package.
- As many projects as the community can do in a 36-month construction period. Many funding programs require that the entire pre-construction and construction period last no longer than 36 months. Therefore, a community can consider rolling together as many projects from the capital facilities plan as can be accomplished in a 36-month period.
- Six years' worth of improvements. A community may want to secure all the funding for a capital facilities plan's six-year period. This way, the community doesn't have to keep applying and reapplying for funding.

- Projects linked by a common goal. A package can be made up of projects that all have the same goal; or that all increase available capacity for economic development; or a group of projects that primarily affects the downtown area as a segment of the community's downtown revitalization program.

- As many projects as the community wants. Some communities want to do as many projects as they can in the interests of a well-kept system. Ultimately, communities tend to balance financing with needs and attempt to fund projects to the limit of affordability.

Although there are advantages in grouping packages, smaller projects sometimes have a better chance of being funded, because they represent smaller portions of an agency's overall pool of available funds. Small projects also may be able to demonstrate a higher priority need on a case-by-case basis.

Project packaging also paves the way for future opportunities as they arise. If a newly arrived business can help pay for improvements, a community can focus its attention on the improvements eligible for that new funding source. Project packages also can streamline the process by reducing the number of separate consultant selection processes and improve project coordination efforts and expenditures.

As a final note, packages of projects are not written in stone. A community will probably find itself repackaging a group of projects based on need or new opportunities. Packages can help guide the financing plan as long as the community can update the packages to meet local needs and take advantage of new opportunities.

Single funding source vs. multiple funding sources

There are many advantages to having only one program fund all needed system improvements. These include having only one set of reporting and reimbursement guidelines, one point of contact on grant or loan management issues, and a limited set of regulations to follow before and during construction. However, many projects cannot be funded by only one source. Because of maximum award limits, ineligible project costs or the need for matching funds, more than one source of funding may be necessary. In fact, many funding sources regard partnerships with other funding agencies positively when they evaluate the project funding application.

Tip

The U. S. Department of Agriculture-Rural Utilities Service (USDA-RUS) often partners with other funding programs, frequently as the last source for a package of projects. However, involve USDA-RUS staff (and other program staff) in the discussions early so they can observe how funds from other programs will be used.

When choosing which program(s) to use in financing a project, assume the worst case scenario (no grant, all loan/bond). Consider which loan or combination of loans will give the lowest annual payment (and therefore, the smallest increase to user rates) and which offers the lowest total cost of principal and interest payments over time.

It usually is easy to compare the payback terms of one single program to another, but when two or more funding sources are used, the reality is that there may be more than one right answer to which combination of programs is best. How does one determine which ones are possible *and* realistic? Usually by using a calculator or computer. Consultants and technical assistance providers can be of assistance when comparing funding sources and working out different debt scenarios.

- Use a computer. Most spreadsheet programs (like Excel, Lotus 1-2-3 or Quattro Pro) can

easily solve for many variables. Spreadsheet "solvers" require the user to input what qualities are desirable and what constraints exist, then determine what combinations of funding programs meet those criteria. When trying to determine the different combinations of loan programs that would be possible, some constraints might deal with keeping user fees at a certain level or minimizing the number of funding programs involved. The spreadsheet solver function would create a list of different multi-program funding scenarios. A community can then look at which scenarios best meet local needs.

- Trial and error. Pick any two programs and divide the total debt equally between them. Use debt amortization factors to calculate what the annual cost of repaying each loan is. See if the total annual cost of repaying the debt is cheaper than if the entire debt was being repaid by only one source. Now, using the same programs, give one program a greater portion of the debt and recalculate the total annual cost of repaying the loan. Examine how it changes. Change the portions so that the other program now has a greater portion of the debt and recalculate the total annual cost of repaying the loan. Continue to do this until a pattern emerges.

User rate impacts

Regardless of which financing programs are used, consider the impact of the financing package on user rates.[7] To calculate the impact, first determine what it will cost to pay back the debt. Then compare how much user rates will need to increase to do so. Of course, water system revenues should pay only for water system expenses, and wastewater system revenues should pay only for wastewater system expenses.

As a quick example, suppose a community having 500 sewer connections would like to take out a $1 million loan at 5 percent interest over 30 years. The annual payment on that debt would be approximately $65,051. Now, we need to factor in debt coverage. To guarantee that the loan could be repaid, the lender is likely to ask for debt coverage. Assume that the lender requires 20 percent debt coverage on the loan, meaning that the community will actually have to budget for an annual debt payment of over $78,000 (20 percent of $65,051 = $13,010). This amount would be spread over the user base (500 connections). User rates would increase by about $13 per month to cover the loan, including debt coverage requirements. Of course, this would be in addition to any existing debt the system already has.

Tip

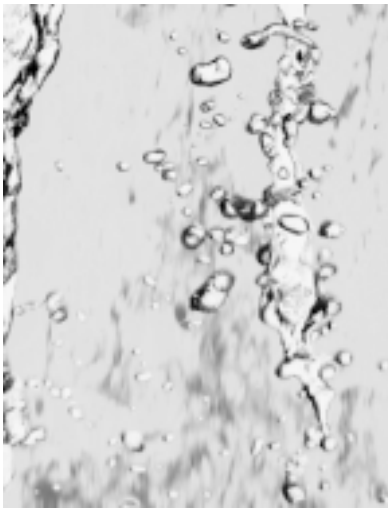
The amount of debt coverage that will be required depends on the lender, program or bond buyer issuing the debt. For example, USDA-RUS prefers to have 10 percent coverage. Many commercial lenders (banks) prefer to have debt coverage of 40 percent.

To determine what the total user cost will be, we must include the amount of revenue needed to pay back both the debt and non-debt expenses (such as expenses for operation, maintenance and reserve contributions). Depending on how costly these are, rates may be beyond the means of system users. If users cannot afford the rates required to repay a certain loan or bond, the financing plan will have to be adjusted. Consider either reducing the amount of debt being taken out or refinancing old debt.

[7] This assumes that the system has a sound rate structure to begin with, which means that the system's revenues exceed expenses. For more information about rate setting, contact Rural Community Assistance Corporation at 360/493-2260 in Washington or 503/228-1459 in Oregon.

Adjusting for inflation

Non-debt expenses increase every year due to inflation, so simply adding new debt to this year's non-debt expenses is not enough to estimate future payback amounts. Consider the following example: A small system currently has total annual system expenses of $108,000. If $30,000 of this is debt expense, then the community has annual non-debt expenses of $78,000. Over time, the non-debt expenses will go up with inflation, while the debt expense is usually fixed over time.



To estimate the effect of inflation, multiply this year's annual non-debt expenses by an inflation factor. A simplified inflation factor can be calculated by multiplying .044 by the number of years in the future being considered, then adding 1.04. For example, if the community wants to estimate its expenses for three years from now, the inflation factor for these calculations is 1.172. Multiplying the community's annual non-debt expenses ($78,000) by 1.172 gives an estimate of what the annual non-debt expenses will be in three years ($91,416).

Determining affordability

How does a community decide if user rates are affordable? The commonly accepted method is to compare user rates to local incomes. Funding programs often compare a community's average utility rates to the area's median household income[8] (MHI). In Washington, both the Department of Health (DOH) and Department of Ecology (DOE) consider average user rates that are at or below 1.5 percent of the MHI per utility to be "affordable." This is consistent with the percentage used by many other states and organizations.

For example, if the MHI for a given area is $1,690 per month ($20,280 per year), both DOH and DOE might consider monthly user rates up to $25.35 (1.5% x $1,690 = $25.35) per utility affordable. This amount includes debt service, reserve contributions, and operation and maintenance costs.

One and a half percent of MHI is only a guideline. Actual affordability will vary by community. Some funding programs, like USDA-Rural Utilities Service, require that at least 1 percent of the MHI goes toward debt repayment before a grant will be offered as part of the funding package.

Increasing rates

One of the reasons for putting together a multi-year system-financing plan is to determine when rate increases will be needed to finance improvements and how much those rate increases will be. Having a long-term plan allows you to gradually phase in rate increases over time. This will avoid "shocking" the users, who may need more time to adjust their personal budgets or cash flow to accommodate new rates.

The percentage change in user rates is one factor to consider regarding impacts on ratepayers. If there is a significant percentage change in rates, users will react more strongly and more negatively. Of course, many users don't react to percentage increases as much as absolute numbers. Raising rates by $5 or $10 is often seen as a significant increase, as is going from $10 to $20 or from $20 to $30 per month.

[8] Median household income figures are generated for counties, some cities, and census block groups by the U.S. Census Bureau.

You also may want to compare the new user rates to the user rates of other communities that are similar in size and have similar economic conditions.[9] However, how your rates compare should not be the only criteria you consider when determining if rates are affordable. Local costs reflect site-specific needs, and system needs often differ greatly even between adjacent communities.

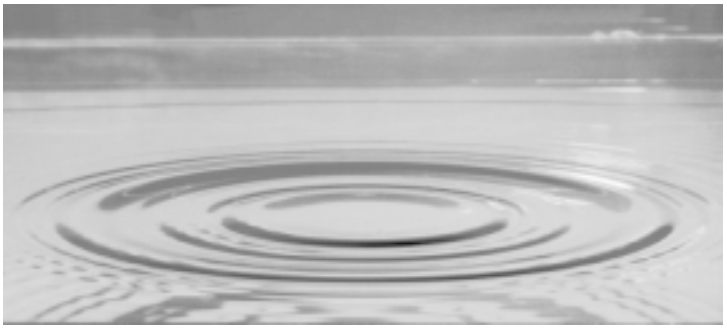
How ratepayers react to rate increases can vary greatly. What is consistent is that most users do not like sudden, high increases without an explanation or opportunity for input. As noted previously, providing information is an important public relations tool.

What if we can't afford it?

After calculating the effect of a funding package on user rates, it may be clear that a community cannot afford to pay for an entire project package solely with loans. If the local affordability of user rates is in doubt, the following options exist for reducing the overall cost of the package or the amount borrowed:

- Take a smaller project out of the package and move it to a lower priority.
- Phase the package. Break it into smaller segments and implement the segments over time.
- Aggressively pursue lower-interest/longer-term financing or grants by contacting agency program staff. Be prepared to conduct income surveys and raise rates to the limits of affordability to demonstrate financial need.
- Share costs with local partners (such as port or private business), if possible.

[9] See *AWC 1999 Tax & User Fee Survey, Part IV: Water, Sewer & Garbage Fees*, Association of Washington Cities, City Engineers Association of Washington, and American Public Works Association Washington Chapter. Contact the Association of Washington Cities at 360/753-4137 for copies.



Conclusion

The need for infrastructure development in many rural communities is real, and chances are, your community is faced with this need. But developing water and wastewater projects is not easy, especially for small communities. Infrastructure development can be an extensive and intricate process with a web of issues and details arising at every turn. Many of the problems encountered may stem from a lack of local experience regarding infrastructure development.

It is possible, however, for communities to improve the experience. Understanding the infrastructure development process is the first step. Communities can make the biggest difference in infrastructure development before construction starts just by learning about the process.

During the planning phase, increasing the amount and quality of communication is vital. Improving communication means working closely with consultants and communicating major issues to the public.

Opportunities for the community to save money by gathering information and developing supporting documentation as part of the planning process have been highlighted.

Once the planning is complete, it is important to become familiar with the various elements of the pre-construction phase of the project. Pre-construction involves the design and engineering of facilities, environmental assessment, and permitting. Here again, chances to improve the project and find money saving opportunities do exist. Last, but certainly not least, is the funding. Financing can be confusing to both professionals and citizens alike. Begin by working with funding program staff to determine which communities and project types are eligible and how much money is available. Target the funding programs that can provide the best financial terms balanced with the least regulatory requirements.

Undertaking a water or wastewater project is a daunting task. Obtaining information is the first step in taking control of the process. At this point, you have already gained an informational advantage by becoming familiar with the process. Seek out other opportunities to learn more about infrastructure issues by contacting technical assistance providers, agencies, local consultants and staff from neighboring communities. Once you have become familiar with the process, follow up by playing an active role. Information and action are the tools to protect and promote your community's interests.

Rural Community Assistance Corporation

This manual was produced in January 2001 by Rural Community Assistance Corporation (RCAC) with funding from the U.S. Department of Agriculture Forest Service.

Founded in 1978, RCAC is dedicated to assisting rural communities achieve their goals and visions by providing training, technical assistance and access to resources. RCAC teaches community-based organizations, rural and tribal governments how to solve problems. With an annual operating budget in excess of $16 million and more than $44 million in lending capital, RCAC is a major resource for the rural west. RCAC provides a wide range of community development services that:

- increase the availability of safe and affordable housing;
- improve the quality and availability of community facilities;
- improve water, wastewater and solid waste management;
- build capacity of local officials and community-based organizations; and
- educate the rural public through publications and training.

The U.S. Treasury certified RCAC as a Community Development Financial Institution (CDFI) in 1996. Financing is available to nonprofit organizations and public entities for affordable housing, community facilities, and water and wastewater systems. Special agricultural worker programs are currently underway for housing and community-based health facilities.

RCAC is headquartered in West Sacramento, California with field offices in Alaska, Arizona, California, Colorado, Hawaii, Idaho, Nevada, New Mexico, Oregon, Utah and Washington. The Colorado office serves Montana. RCAC's core services include affordable housing development, environmental infrastructure development, and community development finance.

For more information, contact RCAC by phone at 916/447-2854; via mail at 3120 Freeboard Dr., Suite 201, West Sacramento, California 95691; or visit the RCAC web site at *www.rcac.org*.

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