WATER LOGGED

SUMMER 2017

THE OFFICIAL PUBLICATION OF THE NEVADA RURAL WATER ASSOCIATION

NEVADA RURAL WATER ASSOCIATION

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Water Logged is the official publication of the Nevada Rural Water Association for distribution to the NvRWA membership; water and wastewater agencies and legislators.

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Bob Foerster, NvRWA Executive Director

State & National Rural Water Associations Advance the Industry, its Personnel and Expertise

Nationally since 1976, and since 1990 in Nevada, groups of utilities have formed Rural Water Associations to fill a much-needed role in representing rural and small systems in legislation, regulatory and federal policy areas. Today, all 50 states combine their collective knowledge and membership to be the leading voice for water and wastewater systems in each state and on the national stage. The results speak for themselves. From building, upgrading and expanding service areas, to supporting the rural economy, your association is here to serve its membership. Thank you for your support through NvRWA and National Rural Water Association. Some of the things we do to support you are:

- Utility Management Certification through Water University
- State training courses, online courses and webinars
- WaterPro Community offers learning opportunities and connects the industry 24/7
- Specialized advanced conferences and training to meet the most relevant needs

State Associations join together as one on the national level through the National Rural Water Association to shape Federal water policy in agencies and Congress. Our full-time, bi-partisan professional staff in DC has extensive experience in the legislative and regulatory process. They help guide common-sense policy and legislation that continues our success in representing your utility, including accessing the highest levels of agencies. For example, NRWA's leadership recently met with EPA Administrator Scott Pruitt and discussed regulatory reform to benefit your utility. Both NvRWA and National Association's success and benefits include, but are not limited to (figures are nationwide, provided by NRWA):

- Experts in drafting assistance and comments on legislation, testimony and budget activities
- Coalition building
- Establishing effective strategy, policy and regulatory activities necessary to represent the industry on a continuous basis with proven results:
  - FY2017- $50 million increase in USDA RUSWater and Waste Loans and Grants
  - SRF funding levels maintained
  - Rural Water members congressional testimony on Farm Bill policies and proposed legislation
  - Rural Water members congressional testimony on infrastructure proposal
  - Rural Water members congressional testimony on EPA funding and proposed legislative changes
  - Participated with White House staff on President's infrastructure bill to ensure membership needs are included in the final bill
  - Annual Rural Water Rally in DC, including publicity opportunity through the Best Tasting Water Contest
  - Retention of 1926(b) protection of district and regional service areas from annexation – *Estimated savings of $11,550,871,000 nationwide*
  - E-delivery of Consumer Confidence Reports – Estimated savings of $126,000,000
  - Successful legislation exempting fire hydrants from new lead standards – *Estimated savings of $3,100,000,000*
  - Filing of Amicus Brief in US 6th Circuit Court opposing "Waters of the US" regulation (WOTUS)
  - Participation in Revised Total Coliform Federal Advisory Group – *Estimated savings of $126,000,000*

Only State and National Rural Water Associations bring together unique products and services designed to meet the needs your utility. Knowledge is the key to success. Explore these valuable resources by visiting nvrwa.org or www.nrwa.org today!

The National Rural Water Association annual conference, WaterPro, will be at the Grand Sierra Resort from September 18-20 this year. Nevada Rural Water will be organizing a Golf Tournament on September 17th at the Lakeridge Golf Course. Put us on your calendar!

The Nevada Legislature just wrapped up the 2017 session. Below is a brief recap on bills passed during the 79th Session of the Nevada Legislature. Our analysis is limited to highlighting bills or portions of bills having impacts on several systems or the water and wastewater industry in general. Please take the time to read the bills. They are available "As Enrolled" at the www.leg.state.us site, click on the session, then bill information, then search by bill type and bill number. NvRWA would be pleased to discuss any questions you may have, but we suggest that questions regarding water rights be addressed to your specialist legal counsel. You will find a listing of Associate Members in the center pages of this magazine; please use those who support our Association through membership and advertising.

Assembly Bill 50 Effective May 22, 2017

NRS 445A.800-445A.955 Authorizes the State Environmental Commission to establish fees for any services necessary to carry out the regulation of community and public water systems.

NRS 445A.950 Increases the maximum civil penalty a from $5,000 to $25,000 for each day of the violation. A person who owns, controls or operates a public water system is liable for a civil penalty for certain violations.

Such person may be subject to an administrative fine per day for certain violations. This bill increases the maximum administrative fine from $2,500 to $5,000

These changes result in the State penalties and fines being more closely aligned with the Federal amounts.

NRS 278.335, 278.377 Authorizes the State Environmental Commission to adopt regulations and establish fees relating to its review of subdivisions concerning sewage disposal, water pollution, water quality and water supply facilities.

Assembly Bill 8

NRS 268.043 Under existing law, the governing body of a city which provides sewerage may have delinquent charges for sewerage collected with the county's general taxes. AB8 expands this authority and provides that a governing body providing sewerage, storm drainage or water service, or any combination of those services, may collect delinquent charges in such a manner. Note that NRS 268 is entitled *Powers and Duties Common to Cities and Towns Incorporated Under General of Special Laws.* Effective October 1, 2017.

Senate Bill 47

Makes various changes relating to the appropriation of water.

NRS 534.090 Please read the legislation yourself, with attention to Section 9, which changes the procedures concerning nonuse of water rights and forfeiture. Effective June 9, 2017.

Senate Bill 51

Makes various changes relating to the adjudication of vested water rights. Effective May 26, 2017

Senate Bill 74

When a Water Conservation Plan is submitted, the State Engineer now has 120 days, rather than 30 days, to review and approve for compliance. Effective June 9, 2017.

Senate Bill 462

Authorizes a board of county commissioners to create a committee to review general improvement districts *to determine if the districts should be continued, modified, consolidated, merged or dissolved.* Effective July 1, 2017 and expires by limitation on June 30, 2021. Anyone involved in a GID should read this legislation. http://www.leg.state.nv.us/Session/79th2017/Bills/SB/SB462_EN.pdf

Senate Bill 471

For General Improvement Districts, when a board of county commissioners determines that it is in the best interests that the district be merged, consolidated or dissolved, the board is required to submit the question of the merger, consolidation or dissolution to the board of trustees of the district. The bill adds the qualifying phrase *'... (district) with annual revenues of more than $1,000,000,'* with the result being that only districts with revenues at this level would necessarily have the opportunity to reject merger etc. Effective Date October 1, 2017.

Senate Bill 54

NRS 377b.100 Governing the use of monies raised by county taxes for infrastructure, now reads '...Sec. 2, 3. (f) ...for the acquisition, establishment, construction, expansion, improvement or equipping of facilities relating to public safety or to cultural and recreational, judicial or health and welfare functions;

(g) The ongoing expenses of operation and maintenance for services and supplies of facilities described in paragraph (f), excluding salaries and benefits;

(h) principal and interest on notes, bonds or other securities issued to provide money for the cost of projects, facilities and activities described in paragraphs (a) to (g), inclusive; or

(i) Any combination of those purposes.'

Effective July 1, 2017

Please note that Water and Wastewater facilities are listed under paragraph 3.(a). While the addition of the phrase 'O&M excluding salaries and benefits' appears to apply just to part 3.(f) facilities, this might open the door to future changes where O&M of other categories of infrastructure becomes an allowable use.

Please be prepared to let NvRWA know your position on new bills as the next legislative session draws near. We will be evaluating bills and asking for your input! You can also help support NvRWA by -

- Letting your Board, your public and your State Legislators know what NvRWA is doing to train and assist
- Sending staff to our training sessions
- Donating personally to the Water PAC, within the limits
- Getting Board members as well as all levels of staff to our Annual Conference
- Contacting members of the Nevada Congressional Delegation
- Sending us letters telling the story of how any of the State and Federal programs we implement helped your community sustain its infrastructure
- Continuing to make the water and wastewater industry shine!

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Another Look at Drought – Part II

By Teresa Taylor, Ph.D., Watershed Specialist

In Part I of this series I introduced the topic of soil complexity, and how the three different and complicated processes that produce it–geology, hydrology and biology–are typically completely separate fields of study. Looking at just the basic the definitions of each of these processes helps illustrate that it would be difficult to be expert in all of them:

> **Geology** is the study of the rocks that comprise the earth, and the processes that modify and change the rocks over time.
>
> **Hydrology** is the study of the occurrence, distribution and movement of water in the earth.
>
> **Biology** is the study of life and living organisms–their distribution, function, growth and other characteristics.

The separate complexity of each of these topics has often resulted in too narrow a focus to fully understand or appreciate the "big picture" of soil from an environmental standpoint. And while this practice of narrow educational focus is not restricted to study of soil, there have been many unintended consequences with this approach when it comes to soil–among them, exacerbation of the severity of droughts.

In the first article in this series, I discussed this with respect to the infamous Dust Bowl of the 1930's, where farming practices of the time contributed to the extreme consequences of several years of drought. No farmer set out with the intention of destroying their land, but in essence, that is what happened for many. Why? Because the importance and complexity of the different processes that create and maintain healthy soil were not well understood.

While no single article could begin to explain this amazingly complicated material beneath our feet, it seemed appropriate given our recent years of drought to take a little closer look at the nature of soil.

Soil is made up of three major components: *solid particles* (various minerals, organic materials (e.g., derived from living matter), etc.), *void or pore spaces* (the "openings" in the soil), and whatever is occupying those voids (typically air and/ or water).

The void spaces are critical to soil development for several reasons. Void spaces are where both microscopic and macroscopic organisms can be found. Such organisms break down solid components of the soil and convert them into mineral nutrients in forms that can be absorbed by plants and ultimately consumed by grazing livestock. The void spaces also dictate the amount of water that can be held in the soil and the way water can move through the soil.

In climates where precipitation is fairly evenly spaced throughout most of the year and land use choices have not interfered with natural processes, most precipitation is either captured (intercepted) by plants, or is able to infiltrate directly into the soil. Little, if any, precipitation runs off along the soil surface. Erosion is minimal, and soils can be built to significant depths through geologic processes, natural plant life decay, incorporation of resulting organic material, and ongoing biologic activity.

Different types of land uses can totally disrupt an otherwise productive "soil water cycle," however, even in areas where precipitation is ample. For example, vegetation clearing for development or agricultural purposes, removes the water cycle "movement" mechanisms created by plants–that is, movement of water toward plant roots where *absorption* occurs, followed by *transpiration* (movement upward through the plant, conversion to vapor and release to the atmosphere).

Removal of vegetation also takes away from the normal addition of organic material that would occur as plants complete their life cycles. This changes the *structure* of the soil, reduces the *biological activity* and reduces precipitation *infiltration* into the soil. With little vegetation to absorb water and reduced infiltration capacity of the soil, increased *evaporation* and *runoff* are introduced into the equation and water is effectively "lost", with neither the soil or the plants that were growing in it benefiting from this moisture. From a soil standpoint, runoff and evaporation are undesirable movements of water.

But let's go on. Soil cleared and left without plant cover develops noticeable changes in its surface texture. Bare ground is very vulnerable to any type of disturbance. Even precipitation tends to act more as a disturbance on bare ground than as a benefit. The impact of raindrops can actually compress the soil, destroying or reducing the void spaces, and washing away the lightest surficial materials, which tend to be the organic materials critical to a healthy soil.

Re-sorting of particle sizes within bare soil also occurs in response to disruptions like precipitation. Smaller or "finer"-grained materials are moved around and tend to settle on the top of the soil, sealing or "capping" remaining pore spaces. This further reduces the ability of water to infiltrate into the soil and further promotes runoff.

When water cannot penetrate into the soil, neither can oxygen. At the same time, carbon dioxide in the soil that builds up through *respiration* (one of the natural biologic processes that occur in soil) can no longer escape. That means the millions of microscopic organisms in the soil that were responsible for breaking down soil components into different nutrients in a form that could be used by plants no longer function effectively. In turn, this leads to nutrition deficiencies in plants (and subsequently in livestock consuming those plants).

But there are still more consequences when water is not effectively absorbed by soil–for example, replenishment of underground aquifers, which occurs by downward infiltration of water through soil, is reduced. In a state like Nevada, which relies heavily on underground sources for drinking water, that's a big consideration.

Fire (either naturally-occurring, accidental, or intentionally-set for hazard reduction) is another mechanism by which plant cover can be removed from soil. While re-vegetation ultimately occurs in burned areas, the time it takes varies as a function of climate and rainfall, topography and interim land uses. The drier the environment, the longer it takes for vegetation to regenerate, and thus the more negative the impact on soil structure and the resulting consequences discussed above.

To recap, when water can readily be absorbed into soil, all of the natural processes continuously occurring within soil work more efficiently. Soil is better able to store water within its void spaces, which means more water is available to support plant growth for longer periods of times, and plant growth will be more vigorous. The soil will be better able to support plant life even *during dry periods–including drought.*

Coming to Terms with "The Cloud"

Tatiana Zehl, Training & GIS Specialist

In the realm of cloud computing "the cloud" is a metaphor for the internet. In cloud computing, resources are shared so that instead of having a particular program installed on a local server or personal device, the computing service or application is delivered through the internet. In other words, applications and services are accessed via the web instead of your hard drive. These services are delivered through the internet and paid for by the customer. Cloud computing applies traditional supercomputing, or high-performance computing power, normally used by military and research facilities, to perform tens of trillions of computations per second. In consumer-oriented applications such as financial portfolios, to deliver personalized information, to provide data storage, to power large immersive online computer games, GIS mapping applications and many others.

What makes cloud computing so appealing is that the cloud infrastructure is maintained by the cloud provider, not by the individual cloud customer. By serving a growing customer base the cloud provider can customize its service platform and gets to charge for services on an as needed basis. As a result, the cloud customers get to use a powerful software platform with virtually no investment cost and, because it's customized to their industry's specific needs, significantly easier to use. In the water industry with operators pressed for time, ease of use is key!

Cloud computing is a topic I just can't resist because it is changing the game for software developers and information technology providers and users in general. Cloud computing is impacting the IT world as much as online sales are changing the retail market! Why does this matter for water, wastewater, and utilities services in general? Because if you're not aware of it, you're probably not getting the best bang for the buck in terms of IT systems and services that you've been relying on! I'm talking about the daily tools that you rely on to keep things running, namely, your maps and your SCADA system.

If you've read past issues of Water Logged, you know that GIS is what I do, so I'll use it as an example of how cloud based services are simplifying applications and making them more accessible. The value of a Geographical Information System lies in the fact that it is a database that can be updated to keep records of field assets with comments, descriptions, links to pictures and work orders. If you only have a map that you can look up, whether it be on computer or paper, it's not a GIS, it's just a map. And when you have to call a contractor to add new features to you map, you're not only paying for something that you could do in house, but chances are you are also not capturing valuable information that if recorded as you go about the work, would prove to be invaluable information.

Because GIS is used by countless industries, GIS software programs include a number of geographical processing and spatial analysis tools that make it very powerful and versatile. However, the versatility and power afforded by GIS software programs, such as the industry standard, ArcGIS, make its menus difficult to navigate and use! Therein lies the power of GIS cloud based services: Their main focus being data collection and record keeping, menus are simple and intuitive and the service is accessible on any internet enabled device, making it mobile to boot!

I've been using ArcGIS online for the past three years or so and the water systems that I work with seem to like it. The ArcGIS online organization account provides a complete GIS mapping platform that enables mobile data collection with linked pictures and work orders. Because it is costly, $2,500 for five users with separate logins, I've been using the free public account option for small rural water systems. Data collection on mobile devices is not possible on the free account, but maps can be viewed on a mobile device, and users can edit and update their maps using a PC or laptop connected to internet. Another cloud GIS service available for Rural Water Systems is Diamond Maps. This service provides one user login for $19/month or $228/year. As does ArcGIS online, Diamond maps allows for data collection and updating, including links to pictures and work orders, using your mobile device. It uses the Google maps images, pictures and maps, which are often more up to date and better quality than the ones available on ArcGIS online. ArcGIS online is more powerful and recommended for large utilities because it teams up with in house ArcGIS software providing tools to streamline procedures for organizations and tools for data processing. On the other hand, Diamond maps costs a fraction of the price, is just as easy, if not easier, to use, and is perfectly adequate for small rural utilities.

One important point to make is that with either service, ArcGIS online of Diamond Maps, you can download a hard disk copy of your updated maps as often as you wish. Thus, your data can be kept safe in your office in case it is needed for another application, such as a hydraulic model, or if you want to migrate to another software platform in the future.

Another example of cutting edge cloud computing services that I ran into during the NvRWA conference this year is SCADA. Cloud based water system control is already available, and because it is cloud based, the design and installation costs can be significantly lowered. Growing the system in terms of adding water system components to control is also simplified and less expensive with cloud based SCADA. Cloud computing options are certainly worth exploring because they are cheaper, highly adaptable and continuously evolving to meet customer needs. And they are here to stay.

What Might Be Causing Pinhole Leaks?

Ryan Kolda, NvRWA Circuit Rider

In the operation of a water system it is important to keep tabs on certain water characteristics; among those characteristics is the potential to promote corrosion. This can often be overlooked and cause issues in the system such as color, taste, and even health concerns and damage to system components. While all of these are of concern, in this article we will focus on what corrosion can do to components of the distribution system.

I have seen a few instances of pin hole leaks forming in system components or color in the water. If a system has had such issues the operators should review sample results and characteristic of the system to determine if the water is corrosive. Pinhole leaks indicate critically thinning pipe walls and can be thought of as the tip of the corrosion iceberg. The industry is acutely aware of the need to control corrosion with respect to lead, copper, aluminum and zinc potentially being introduced into drinking water. When metals are refined into the states in which we use them they are altered from their native state. After that, there is an ongoing battle fight corrosion which is the process of the metals returning to their natural state. There are certain factors that promote the process of corrosion and these are dissolved oxygen, total dissolved solids, alkalinity and pH, temperature, and type of metals in the system. Take a careful look at metals scrapped from your system, check for signs of corrosion or excessive encrustation.

So one of the important elements needed to cause corrosion is dissolved oxygen or DO. Drinking water should have some DO to prevent it from having a flat taste but too much DO can promote corrosion. The amount of DO in the water can be influenced by temperature where colder water can hold more DO than warmer water. This is typically a surface water phenomenon. If the water is found to have excess DO it can be reduced by employing a form of aeration, possibly as simple as placing additional sedimentation basin in service to decrease weir loading, allowing dissolved gasses in the water to reach equilibrium with the atmosphere.

Electrical flow is a necessary factor in the process of corrosion. Pure water is not a good conductor but as the total dissolved solids or TDS increases, so does the conductivity of the water. A conductivity analysis is a fairly effective means of estimating the TDS of a water, once the correlation between TDS and conductivity is known for that water. If the TDS is high the system may need to implement a form of corrosion control to prevent it from becoming an issue. Within the general TDS impact on corrosivity, the mass ratio of chloride ions to sulfate ions also plays a role. External factors such as high groundwater and aggressive soils can greatly influence corrosion.

Water alkalinity and pH have an effect on the rate of corrosion. In most cases as the alkalinity and pH increase, the rate of corrosion will decrease. If the water is prone to a low pH there are treatment methods that can mitigate the situation and reduce the corrosively of the water. Remember that a pH of 7 is considered to be stable and ideally the water should be slightly higher than that to promote the deposit of a light protective coating on the inside of pipes. Very high pH waters can also be corrosive. Recall that the SMCL for pH is a range of 6.5 to 8.5 standard units; a water can be within this range but still be aggressive toward metals.

Temperature is an important factor since the higher the temperature the faster chemical reactions will occur. In the summer the temperature in storage facilities will be higher and could cause issues if stratification were to occur. Cycling the tanks or employing mixers could reduce this issue. As mentioned above, temperature also has influence on the waters ability to carry DO.

Lastly the type of metal being used is a very important factor. Most operators are familiar with the concept of a galvanic cell but some may not be aware that this can occur within the same piece of metal. Metal is not perfectly homogenized so it can form this reaction in itself and weak points will emerge. This could lead to the formation of pinhole leaks where the pathway has formed. Keep in mind the copper and possibly lead-containing components downstream from the distribution system.

If you are finding your system prone to corrosion, or just want to have a better idea where your system water quality stands with respect to corrosivity, take a look at the characteristics of the water that may be causing the issue. A standard way to encompass pH, temperature, TDS, hardness and alkalinity into a single algorithm to estimate corrosivity is the Langelier Saturation Index. First, obtain accurate analytical results for each of the items listed. Most of the figures will be found in your lab reports, or you can look on NDWIS for the records. In particular, lab pH results are often inaccurate because the fifteen-minute hold time is almost always exceeded. NvRWA can assist with a field pH measurement along with training your staff on the method. Field temperature measurement is also necessary for obvious reasons.

Once accurate figures are in hand, plug them into one of the corrosivity index equations. This example from the Office of Water Programs at California State University, Sacramento *Water Treatment Plant Operation, Vol 1, 6th Ed.,* provides an approximation: [Langelier Index = pH – pHs] where pH is the actual pH and pHs is the pH at which water having the same alkalinity and calcium content is just saturated with calcium carbonate. In other words, if the Langelier Index, LI, is positive, calcium carbonate will tend to be precipitated from that water, and if the LI is negative, calcium carbonate, lime scale, will tend to be dissolved away by that water. Dissolution of calcium carbonate is in a sense, analogous to corrosion of metals. The greater the magnitude of a positive or negative LI, the stronger the precipitation or dissolution effect. A desirable operating point is a LI of +0.5 to +1.0 but may be outside this range depending on the water chemistry, seasonal temperature and other factors – remember this is only an indicator. Continuing with the calculation for this guideline, a simplified way to determine pHs uses the formula:

$$pHs = A + B - \log(Ca^{+2}) - \log(Alkalinity)$$

Where A is a temperature driven value from tables, B is a TDS driven value from tables, $\log(Ca^{+2})$ is the logarithm of the mg/L calcium hardness concentration, as $CaCO_3$, and log(Alkalinity) is the logarithm of the total alkalinity concentration in mg/L as calcium carbonate, $CaCO_3$. This looks complicated but you can do it! The tables are readily available from a number of references; again, please contact NvRWA for on-site guidance. The first step is to find accurate data for Hardness, Alkalinity, Total Dissolved Solids, Temperature and pH.

If the water is found to be corrosive, further testing is warranted and a form of corrosion control could be needed. The definitive test for corrosion is the coupon test, where clean, dried, weighed strips of special steel are mounted in the water for a period of time, usually for several weeks, then removed, cleaned, dried and weighed. Selection of effective corrosion control would be determined after more extensive testing, usually with the assistance of an engineering firm, chemical supplier, or other water quality consultant. This might include bench scale or pilot testing. In any case addition of or modifications to a treatment process would go through the Primacy Agency approval process. Common ongoing or continuous corrosivity mitigation measures are pH adjustment, alkalinity addition using soda ash, Na_2CO_3, lime or quicklime treatment, polyphosphate or zinc phosphates addition, sodium silicate addition. In the lime softening process, recarbonation is normally practiced to maintain chemical balance. Corrosion in specific assets such as tanks is often addressed using either passive or impressed current engineered cathodic protection methods and equipment.

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Emergency Response and Recovery Planning

Aaron Hughes, Training and Technical Assistance Specialists, Drinking Water

In the water and wastewater industry, systems will experience different emergencies from within their systems and from external events that the systems cannot fully be prepared for, such as natural disasters as floods, earthquakes, and fires. In some cases, the water system needs to re-evaluate their current operational practices to understand that even a water distribution main break, a pump failure, or water storage tank failure should be considered an emergency.

An emergency response plan is required by Nevada statutes and should already be in place to give guidance on how to take the appropriate corrective actions to regain control and integrity of the system. The emergency response plan should include detailed information on the system, its critical components, its repair or replacement inventory, available emergency equipment, contact information of system personnel, its vendors such as parts and chemical suppliers, commercial plumbers and electricians, contact information for local fire, police, and health agencies, contact for neighboring systems, and important emergency operational procedures. Public notification planning is an essential part of the emergency plan. In preparing for an emergency event, the system should also realize they may be facing multiple system failures caused by one emergency event.

A good step in creating an emergency response plan is to conduct a vulnerability assessment of the system to understand the potential for the failure of identified critical components and their immediate impact of loss of service to the system and its customers.

Water and wastewater systems should understand an emergency can happen at any time. By understanding the potential vulnerabilities of their systems, water and wastewater personnel can begin to understand what information, inventory, equipment, and personnel they might need to begin a recovery operation to bring the system back on-line during an emergency. When conducting a vulnerability assessment of the components of the system, the system should:

1. Identify and describe the system components.

What is the component, its purpose, its impact to the system, age, condition, and if parts are on hand to repair or replace?

2. Assign assumed disaster characteristics.

Identify the most likely emergency events that could occur to the components.

3. Estimate the emergency events overall impact on the entire system.

How large a Loss of service would the system have, or how much system integrity would fail and would the emergency event would cause possible other system component failures?

4. Estimate customer demand for service after the occurrence of an emergency event

How would the system supply water to the system, would adequate supply be available for public health and safety? How will the system communicate with customers and who will be the point of contact for both customers and outside agencies such as County emergency management?

5. Identify key system components that would primarily be responsible for system failures.

Is the age and condition of the system component a likely cause of a system failure? Is there an Equipment Repair and Replacement Fund? Is the system component part of a Capital Improvement Fund?

In terms of information, water and wastewater personnel can gain understanding of the full impact if an emergency event occurs to their systems and loss of service to their customers through a vulnerability assessment of their system components. Water and wastewater personnel can identify their systems weaknesses and start creating an emergency response plan that is specific to their systems. It will also allow for the creation of written operational procedures to be developed to create a recovery operational plan.

At water and wastewater systems, there is the experience of past emergency events which has proven several factors that can impact the speed of recovery for systems during an emergency event. These factors are:

1. The absence of trained personnel to make critical decisions and respond to rapidly changing system conditions;
2. Lack of emergency power equipment to operate key system components;
3. Lack of inventory or equipment for repair or replacement system components;
4. Lack of reliable communication systems;
5. Lack of complete emergency response training by all water system personnel, including board members, managers, administrative, and operational staff.
6. Lack of joint training with police, fire, emergency planning, and health agencies.

An emergency response and recovery plan cannot possibly cover all emergency events. It can, however, act as a starting point for preparation and while during an emergency event. It can also assist a system in determining its health and reliability and if there are things that can be done before they actually experience an emergency event. It also allows for system personnel to be given training on operational procedures which will facilitate a faster recovery from an emergency event and give them confidence in their abilities and the systems they operate. After emergency events, and recovery has been achieved, water and wastewater personnel should meet and discuss the event to revise or improve the emergency response and recovery plan.

There are many resources available to water and wastewater systems in Nevada. Getting to know your neighboring utilities is very helpful. Knowing what resources are nearby and who the people are can go a long way toward making emergency response and recovery go smoothly. One statewide resource is the Nevada Water/Wastewater Agency Response Network. NVWARN coordinates, and utility members provide the needed assistance for utilities during an emergency. NVWARN allows water and wastewater utilities to request parts, equipment and personnel to assist during natural or man-made events that impact water and wastewater systems. More information about this important resource can be found at the web site https://www.nvwarn.org/. NVWARN meets regularly, including at the NvRWA Annual Conference. Nevada Rural Water Association can be a point of contact for small systems to activate the NVWARN system.

The ongoing cycle of planning, training and plan updating is essential for all utilities. Nevada Rural Water Association staff can assist water and wastewater personnel with conducting a vulnerability assessment and developing or updating the emergency response plan. We also offer training using tabletop exercises for emergency preparedness. As you know we can assist with developing standard operating procedures, and assist with digitizing system maps. If a system would like assistance, please contact the NvRWA office.

Fire Hydrants

Dan Tarnowski, NvRWA Circuit Rider

Fire hydrant, hydrant, fire plug, johnny pump, tap, et al., are all words to describe one of the most important appurtenances of the distribution system. However, it is often one of the most ignored appurtenances on the distribution system.

There are two common types of fire hydrants used: dry barrel and wet barrel hydrants. Climate is the major consideration to determine what type of hydrant to use on a system. Warmer year-round climates can utilize a wet barrel hydrant. However, a wet barrel hydrant should not be used in climates that are freezing for any period of time.

Dry barrel hydrants, the most common type used in the Nevada climate, can be found in three different valve types: center stem, gate, and corey.

Figure 1 is a dry barrel hydrant with independent operating stems for each hose connection. This allows the hydrant to be charged before the hose is connected to the nozzles.

Figure 1

Figure 2

The center stem model pushes the valve to the bottom of the foot when the stem nut is turned to the fully open position.

The gate model hydrant uses a gate valve to stop the flow of water through the hydrant. The turn of the stem nut raises the gate valve and allows the water to enter the hydrant.

The corey model hydrant uses valve operating nuts on a piece of all thread that pulls the valve open in a scissor jack-like fashion with the operating arms.

When each model of dry barrel hydrant is closed, the operator needs to be patient before tightening the cap on the nozzle. The barrel needs to drain completely. The operator can verify that the barrel is empty by placing his or her hand over the nozzle. If there is a popping sound when the hand is removed from the nozzle, then there is water still draining out of the barrel. When there is no more sound from the nozzle, lubricate the threads with approved AWWA lubricant, and secure the cap.

If the cap is tightened on the nozzle too soon, then the water trapped in the barrel could freeze in cold weather conditions.

Wet barrel hydrants, figure 2, have the pipe continuously charged with water. After removing a cap, the turn of the corresponding operating nut will give you water immediately. After shutting the valve, the pipe stays charged. Each nozzle has its' own operating nut. The way to shut off water to the hydrant is by closing the isolation gate valve. Wet barrel hydrants can be above ground or below ground known as flush hydrants.

No matter what fire hydrant is used, when the hydrant is opened or closed, it needs to be fully open or fully closed. Just like any valve, when the valve is fully opened or fully closed on the hydrant, turn stem or operating nut back 1/4 turn.

Some uses for fire hydrants are for fire protection, delivery of construction water, main flushing, et al. One purpose of fire hydrants is to flush mains, which is done after repairs to the main to help remove air, highly chlorinated water, particulates from a treatment process like ice pigging or main repair, discolored water, and many more reasons.

Some fire hydrants are located on dead end lines. They are utilized to flush dead end lines or mains. When service connections are located too close to a hydrant, a backflow condition could happen if a resident opens a faucet while the hydrant is flowing.

A hydrant flushing program should be done at least one time a year but no more than twice a year. The hydrant flushing program should follow prescribed process so that any debris that may be in the mains can travel in a controlled direction. The flushing program should accompany or follow a valve exercising program.

While flushing the hydrants, they should be maintained and flow tested. The hydrants should also be numbered for locating them quickly. Accurate records should be maintained, such as in a digitized mapping system. If fire department personnel flush and flow test hydrants in a system, a deal of coordination and training is needed. Closing or opening a hydrant too rapidly can set up water hammer with potential damage to the buried infrastructure. Flow test data can help the drinking water operations specialist understand system conditions and is likewise important to the fire department, and should be freely shared by those conducting tests.

Maintenance

This is a short list of some maintenance items that should be followed on hydrants:

1. Inspect for leakage and make corrections when necessary.
2. If the water contains residual disinfectant, take all necessary measures to prevent disinfectant from reaching any surface water body. This might require using a chlorine neutralizing chemical.
3. Remove one nozzle cap, install hose and diffuser or dechlorinator if used, then open hydrant fully, checking for ease of operation. Be safe, do not stand where water from the hydrant or a loose nozzle cap might strike you or coworkers. Do not lean over the top of the hydrant while operating the valve nut. Use a proper hydrant wrench.
4. Flush hydrant to waste, take care to direct flow; use a diffuser. If testing, close valve, install test equipment and conduct flow test.
5. Close the hydrant. Remove all nozzle caps and inspect for thread damage from impact or cross threading. Wire-brush the nozzle and cap threads. Clean and lubricate outlet nozzle threads, preferably with a dry graphite-base lubricant and check for ease of operation. Be sure that the outer nozzle cap gaskets are in good condition.
6. Replace caps, tighten with a spanner wrench, then back off on the threads slightly so that the caps will not be excessively tight but will leave sufficient frictional resistance to prevent removal by hand.
7. Check for any exterior obstruction that could interfere with hydrant operation during an emergency.
8. Check dry barrel hydrants for proper drainage.
9. Close the isolation valve and conduct preventive maintenance such as internal stem lubrication.
10. Clean exterior of hydrant and repaint if necessary. Adhere to AWWA standard colors for flow ranges, if this is your system policy.
11. Cycle the isolation or auxiliary valve through its full range of operation and be sure that the auxiliary valve is left in the fully opened position.
12. If a hydrant is inoperable, tag it with a clearly visible marking to prevent loss of time by firefighting crews if an emergency should arise before the hydrant is repaired. Immediately report the condition of the fire hydrant to your fire department.
13. Prepare a record of your inspection and maintenance operations and any repair work.

*A similar list can be found in Fifth Edition of Water Distribution System Operation and Maintenance, by CSUSAC OWP, on page 253.

Basic Knowledge

There are several basic knowledge items that every operator should know. They are:

1. Hydrants should be spaced 300-600 feet apart but 500 feet is recommended.
2. Careful installation inspection is needed for dry-barrel type hydrants to ensure sufficient drainage while avoiding having thrust bloc concrete blind and plug the drain mechanism.
3. Hydrants should be set in from the curb 2 feet as opposed to figure 3.
4. The traffic break-away flange should be 2 inches off the ground level as opposed to figure 3.
5. Hydrants should be located at intersections.
6. There should be no more than one extension on a fire hydrant. Order one having the right length.
7. Opening and closing of hydrants must be done slowly or water hammer will occur.
8. Recommended painting of hydrants according to flow ranges:

a. 1,500+ gpm	Light Blue
b. 1,000 to 1, 499 gpm	Green
c. 500 to 999 gpm	Orange
d. Less than 500 gpm	Red

9. Keep the area around a hydrant clear as opposed to figure 4.

More information on fire hydrant maintenance can be found in AWWA's M17 Manual.

If hydrants are not flushed on a regular schedule, then customer complaints will increase, ranging from color issues to taste complaints to plugged service lines.

Figure 3

Figure 4

Career Paths in Drinking Water Part II

Rick Norris, NvRWA Training Assistance Specialist

In part one of Career Paths in Drinking Water, two career paths were presented to give some idea of the potential working in the drinking water field. So, the next question might be "How do I get started in one of these drinking water jobs / careers?" We are going to look at some ways to get your start in a drinking water career.

First think about where the jobs in water are located. Here in Nevada there are nearly 600 permitted public water systems, and hundreds of wastewater treatment systems. These systems range in size from the very small rural facility such as a C store providing drinking water to a minimum of at least 25 people on a regular basis, to very large municipal water systems serving many thousands of customers. All of these systems will have some source of water, most often a well. They will all have some form of distribution system which transports the water from the source to the end use points of the system such as sink faucets in a C store or customer meters in a town system. Many of these systems will have storage facilities, pump facilities. Some will have treatment facilities for maintaining and improving water quality. Others will have water quality laboratories; there are also a number of certified commercial labs. All of the different components of a water system will need some form of operation and ongoing maintenance. Although not all of the systems in Nevada will have to hire someone to operate and maintain their system, many will have openings. That is a large pool of jobs that need qualified people to fill them.

Next let's look at what public water systems are looking for when the time comes that they need to hire someone to help operate and maintain their system. For very small systems the ability to train and provide avenues for improvement to people they hire becomes very important. Someone who wishes to get a start in water should have some type of mechanical aptitude and be able to perform a certain level of physical activity. Often the small systems will have no requirement of previous system operation experience and will provide on the job training for the right candidate. These same small systems will expect the candidate to work towards obtaining certification in distribution and / or operation of their systems.

Most public systems large enough to have a need for an operator / maintenance position with the water system will also be required by the State of Nevada regulations to have a certified operator responsible for the system. This person is responsible to ensure the water system meets all of the standards and regulations surrounding public drinking water systems and the water they provide to the public. To obtain a certification in Nevada for distribution operator or treatment operator you must first pass a test administered by the Bureau of Safe Drinking Water. Once the test is passed an "Operator in Training" or OIT certification is issued. To transfer the OIT into a full operator certification, on the job experience will be needed. This is why small systems will sometimes hire without previous water system experience.

Having an OIT in-hand tells the employer you are serious.

Nevada Rural Water Association provides training and assistance for water systems. We help with preparation for operator certification tests and offer assistance with sometimes difficult operational and maintenance duties within the system. NvRWA also offers board training and guidance for proper physical plant and financial management, digital mapping, and administration of public water systems which includes the retention of qualified operations and maintenance personnel.

Over time in a water – wastewater career, higher levels of certification can be obtained. More work experience and higher-level testing will be required. Generally larger public water systems are required to have staff with higher levels of certification due to the more complex nature of the system. In some cases, systems may require college level credits for certain jobs. In most situations experience in the drinking water field will substitute for college credit. To maintain a Nevada distribution or treatment operator certification continuing education hours will be required. Nevada Rural Water Association, NvRWA, provides opportunities to obtain the needed education hours. Every year in March NvRWA offers a Training Conference where industry experts provide class room instruction over a four-day period. Classes are approved by the State of Nevada and count towards the education hours needed to maintain certifications. Systems across the state understand this type of continuing education is necessary to keep up to date, and to keep qualified persons working in the drinking water industry, and generally support worker participation in these activities.

So, where does a person find these positions and how do they apply? The first place to look for Nevada jobs would be NvRWA web site. The site has a list of current job openings under the classified tab on the home page. The posted jobs come with brief job descriptions, contact information, and application instructions. For other sources of job information, both for nationwide openings and to look at a variety of job descriptions, visit AWWA Career Center, and WEF Job Bank.

In order to apply for most water system jobs, you will need a resume. Keep your resume clear and concise. Include any work experience such as operating heavy equipment, working in a regulated industry or quality control, working with chemicals, electrical, plumbing, maintenance, demonstrated computer literacy, record keeping, and working with the public. Make sure you include special training such as OSHA, trenching safety, First Aid/CPR. Most systems are part of local government and will generally require that their application be completed. Be honest and thorough when filling out your application. Do not embellish your experience but do include key words related to the position. These words are in the job description and give insight into what the system is looking for to fill the position. Make your application stand out by writing a short cover letter detailing your interest in the position.

Entry into a career in drinking water / wastewater is relatively simple and the requirements are less than for some other occupations. How far a person would like to progress in the industry is really up to the individual and how much determination and drive they apply to their chosen career path. The fact is a person can start with minimal experience and progress as far as they would like in a water career. I have seen no limitation to what I could achieve in my personal career in drinking water and have been very satisfied with the path I have chosen.

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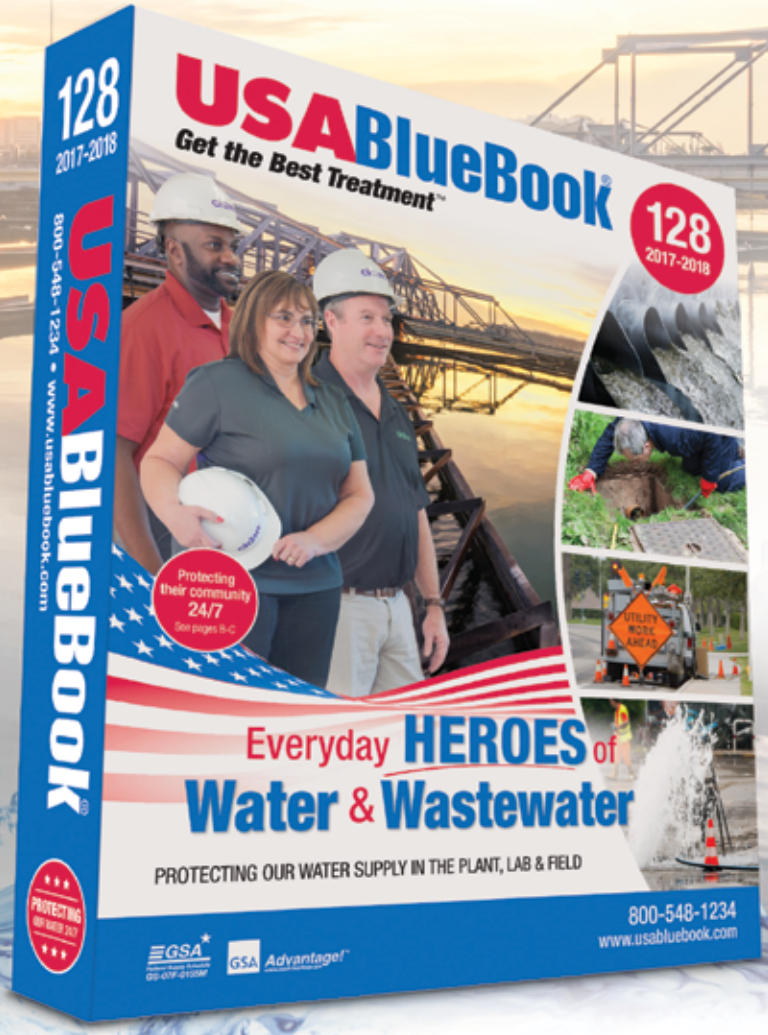

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