Community Growth Best Management Practices for Conservation of the Cave Springs Cave Recharge Zone

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Introduction

Northwest Arkansas, including Benton County and all or parts of 19 other counties in northern Arkansas, is in the Ozark Highlands Ecoregion. The Ozark Highlands include portions of Arkansas, Oklahoma, Kansas, Missouri, and Illinois. This is a region of karst topography, eroded to form steep hills, valleys, and bluffs. Karst is a distinctive topography in which the landscape is largely shaped by the dissolving action of water on carbonate bedrock (usually limestone, dolomite, or marble). This geological process, occurring over many thousands of years, results in unusual surface and subsurface features ranging from sinkholes, vertical shafts, losing streams, and springs, to complex underground drainage systems and caves. Surface waters are commonly transported through these underground conduits and contribute to the groundwater basin.

This area was once covered in a shallow tropical sea. When ancient marine organisms died, their calcium rich shells and skeletons sank to the bottom of the sea, forming thick calcareous deposits. These deposits became today's bedrock of limestone and dolomite. Later a magma pulse pushed up the Ozarks and fractured the limestone. Fractures are enlarged with the dissolution of limestone by mildly acidic waters. These processes formed the caves, springs, and other underground passageways we see today.

Consequently, karst areas, such as northwest Arkansas, contain numerous exposed karst features and subterranean passageways. Surface water enters groundwater systems rapidly as it passes through broken bedrock under thin layers of permeable soil. Groundwater in karst areas can travel as quickly as a few thousand feet to over a mile per day. If the surface water is polluted, the groundwater will also be polluted and sensitive habitats will no longer be able to support delicate cave animals. The Cave Springs Cave recharge zone is the perfect example of this kind of surface water/groundwater interaction. These and other characteristics of karst ecosystems make the surface/groundwater environment fragile and highly susceptible to human disturbance.

Many highly specialized and sensitive fish and wildlife species such as bats, salamanders, cavefish, and crustaceans (e.g., cave crayfish, isopods, and amphipods) spend all or part of their entire life cycle in these unique and sensitive habitats. Cave Springs Cave contains endangered gray bats (*Myotis grisescens*), threatened Ozark cavefish (*Amblyopsis rosae*), and several sensitive crustaceans. In fact, Cave Springs Cave contains half of all the known Ozark cavefish in the world.

Two studies were conducted to determine the area where surface water enters underground conduits and travels to Cave Springs Cave. That recharge zone is sixteen square miles and includes land between Cave Springs, Rogers, and Lowell, Arkansas.

To minimize impacts to threatened and endangered species and water quality in the Cave Springs Cave recharge zone, the United States Fish and Wildlife Service (Service) recommends the following Best Management Practices (BMPs).

Erosion and Sediment Control

BMPs should be implemented for all construction projects within karst landscapes. BMPs should include the use of filter fences, straw bales, interceptor dikes and swales, sediment traps, ditch checks, and detention basins, mulching, seeding, and/or revegetation as appropriate. In some cases, matting or netting may be required on steep slopes and stream banks. Erosion and sediment control measures should be sized to handle at least the 25 year flood and 24-hour storm event. Erosion and sediment control BMP's should be implemented wherever necessary to prevent sediment and contaminants from entering groundwater and the karst landscape.

It is important that construction planners reduce erosion and sedimentation into streams and karst features by:

- Identifying areas with potential for erosion problems prior to construction initiation.
- Avoiding wetlands and low lying areas.
- Restoring steep embankments by seeding, mulching, fertilizing, and implementing erosion control measures such as silt filter fabric fences, straw bales, matting, and sediment traps. It is critical that soil stabilization be completed immediately after the earth work is completed.
- Restoring steep approaches to stream crossings by seeding, mulching, fertilizing, and implementing erosion control measures such as silt filter fences, ditch checks, straw bales, matting, and sediment traps. It is critical that the restoration be implemented immediately after construction.
- On approaches to stream crossings, drainage control structures should be located at the top of the slope/bank and at the base of the slope/bank. Runoff should be routed to stable slopes on either side of the right of way, or routed via temporary conveyance structures to the base of the approach slope where it can infiltrate into the stream bank and eventually seep back to the channel.

1. Filter Fences and Straw Bales

Filter fences, or a combination of filter fences and straw bales, should be installed to prevent or minimize sediment from steep slopes and disturbed areas leaving the construction site and/or entering streams or karst features. Sediment detention structures should be used in areas with moderate to high erosion potential. Filter fences are useful to intercept and retain small amounts of sediment under sheet flow conditions and should

be placed along the borders of water bodies wherever disturbance or construction occurs near a water body. Filter fences should be a minimum of 10 feet from the ordinary high water mark of wetlands, streams, and rivers. The natural vegetation should be retained within the 10 foot buffer zone. Filter fences should be used in areas subject to erosion where the drainage area is one acre or less, but for larger areas a sediment basin should be also used. Filter fences should be used on slopes no greater than 1:1. The maximum flow path to each fence should be about 100 feet. No concentrated flows should be directed toward any fence. Filter fences should be trenched up slope from the barrier and supported by posts spaced a maximum of six feet apart.

Straw bales are one of the most commonly used sediment control methods. Straw bales should be used in areas subject to sheet flow and erosion and where the drainage area is no greater than 1/4 acre per 100 foot of barrier length and the maximum slope behind the barrier is 50 percent (2:1). In most cases, bales should be placed in single rows along contours with the ends tightly abutting one another. To ensure that there is no underflow the bale barriers should be entrenched. Whenever possible, the back side of the bale should be an undisturbed natural area. If the area behind the barrier has been disturbed or is naturally subject to erosion, the barrier should be back filled. All bales should be tied and staked. Filter fabric fences and straw bales should be maintained throughout the construction period and inspected daily during prolonged rainfall and immediately after each rainfall event.

2. Sediment Traps

Sediment traps are small temporary ponding areas used to detain stormwater runoff and allow sediment to settle, thereby minimizing the amount of sediment entering streams and rivers. Sizing criteria for the traps include inflow and sediment load, but traps are generally used for small drainage areas less than three acres. Because sediment traps filter out all but the finest sediments, filter fences are necessary at the outfall of the trap to retain silt and clay-size sediments.

Sediment traps should be located to intercept runoff from disturbed areas and should be located away from natural stream channels. A sufficient number of traps should be constructed to intercept runoff from the disturbed area and have sufficient capacity for potential storm events and accumulated sediment. Sediment traps should be designed for the specific disturbed area, for bare soil conditions, and typically for a 75 percent removal efficiency of sediment runoff. Sediment traps should consist of check dams located within an enlarged section of the interception ditch on stable ground. Stable ground should be identified as those areas with well drained soils and/or where vegetation remains in place to provide sufficient root strength to prevent sliding. In areas where stable ground is not available, several small check dams should be used to prevent buildup of excess water. Traps should have both a low-flow outlet and an emergency overflow. Rock should be placed at the outlet and overflow to prevent erosion where the

water enters the downstream drainage way. The outlet pipe, if needed, should be sized to pass runoff from a 25 year flood and/or 24-hour storm event. Traps should not be constructed on fill material.

3. Mulching and Revegetation

Mulching and prompt revegetation should be used to minimize erosion of exposed soils. Vegetation should be re-established as soon as possible on all disturbed ground, including access roads and trench backfill. Vegetation (use native vegetation when possible) should be planted in the same growing season as construction or immediately following construction, or if not possible, the disturbed areas should be covered with straw, matting, or some other erosion control material in the interim. At most locations, broadcast seeding and the replacement of saplings should be the predominant method of revegetation. Seed should be planted by either a hydroseed method or by covering with mulch. A grass and forb mixture recommended by the Natural Resource Conservation Service (NRCS) and the U.S. Fish and Wildlife Service (Service) should be used to reseed slopes and fertilized where suitable (do not over fertilize). At locations where the terrain or other conditions would combine to cause a high risk of erosion, the revegetation method should be to drill plant grasses or hydroseed over the steep slopes and then cover with straw or matting.

4. Permanent Stabilization

Material that was pushed aside to make temporary level working areas should be replaced onto the disturbed area. The original contours of the land should be restored as closely as possible. Equipment access crossings should be removed. After the contours have been re-established, the topsoil that had been previously segregated should be redistributed across the surface of the disturbed area. Water bars should be graded horizontally across the slopes to help prevent gullying and erosion. Areas compacted by heavy construction equipment should be chiseled and disc-plowed to loosen compacted soil. Following final grading, the disturbed area should be stabilized by replanting with non-invasive plant species. Forested and shrub areas that have been impacted by construction but are not to be maintained as part of the right-of-way access road should be replanted with suitable native tree and shrub species. Within floodplains, ground stabilization should include only rooted or anchored features, used to slow runoff velocity, and erosion until vegetation is re-established. Steep slopes may require the use of matting or netting to help stabilize soil while new vegetation is established. Disturbed stream banks should be stabilized using appropriate vegetation (native if possible). Wetlands should be stabilized by replacing the original subsoil and topsoil, replacing vegetation, and returning the topography and hydrologic characteristics of the wetland as closely as possible to their original form. Disturbed wetland buffers should be stabilized by replanting appropriate vegetation.

Construction in Sensitive Areas (stream channels, karst)

Additional measures should be required for construction near sensitive areas which include stream channels and karst features. Care should be taken when working around streams and

caves to prevent unnecessary damage to or removal of vegetation. **If a cave or fracture is breeched or surface water is rerouted into a karst feature, all activities should cease and the Service should be contacted to assess the situation and provide further consultation before proceeding.**

Staging areas should be placed at least 300 feet away from stream banks and wetlands whenever possible. In addition, all streams, ponds, and wetlands adjacent to disturbed areas should be protected by the use of filter fences, straw bales, or other BMPs to prevent sediment from entering the water body. At stream crossings, a number of measures may be necessary to decrease damage to waterways. In streams with large enough flow, temporary in-stream settling ponds should be used to catch sediments generated by construction. These sediments should be removed as soon as construction is completed in that area. For smaller streams or where appropriate, stream waters could be bypassed through construction areas by the use of flume pipes, pumps, or coffer dams. Stream waters can also be bypassed using directional drilling techniques, as discussed later.

Streams and karst areas should be restored and banks stabilized immediately following construction activities. Native plants, matting, netting, and other BMPs should be used to stabilize banks. Instream deflectors and anchored logs should be used in high velocity streams to protect vulnerable banks and allow for reestablishment of vegetation. Riprap revetment should also be used, if necessary, to help stabilize slopes in areas of high velocity stream flows. The use of riprap should, however, be minimized. Rock typical of the local geology should be used if available. Monitoring of BMP performance in critical areas, particularly at sensitive stream crossings and stream approach slopes should be conducted and documented on a routine basis prior to and after major storms during construction and operation. Based on monitoring, additional BMPs or other improvements may be necessary to insure minimization of impacts.

Extreme caution should be used during construction in the vicinity of the streams and karst features inhabited by sensitive and federally threatened and endangered species. Please contact the Service if you are unsure of the occurrence of species in the planned construction area.

All efforts should be made to minimize stream alterations which could impact water quality and fish and wildlife resources. Construction along streams should not take place during fish spawning seasons if possible.

The true extent of the subterranean environment is difficult to clearly delineate. Undiscovered karst features; such as cave openings, sinkholes, and underground passages; may occur on or near your project site, even in previously developed areas. Therefore, the Service recommends the following precautionary measures be taken to avoid impacts to groundwater and sensitive/endangered species which may inhabit karst features not previously surveyed:

1. Survey existing and any new right-of-ways for karst features such as cave openings, sinkholes, losing streams, and springs.

2. Establish a buffer area of 300 feet or greater around any caves, sinkholes, losing streams, and springs found during the survey (or during any aspect of project implementation). The Service should be contacted for further evaluation to determine if the cave is used by federally listed or sensitive cave species.

3. If a cave is used by federally listed or sensitive species, the Service will likely request that the cave be mapped to determine if any additional openings or passages may be affected by the project. In addition, we may recommend modifications of the proposed project to allow additional buffer areas to be established. Incorporation of additional buffer areas may be necessary to avoid impacts to federally listed or sensitive species.

4. In the event that holes or other openings are encountered during construction activities, the Service requests that work efforts cease within 300 feet of the opening. The opening should be adequately marked and protected from work activities, and the Service should be contacted immediately. No fill materials should be placed into the opening until Service or Service approved personnel have the opportunity to investigate the site thoroughly.

5. The Service should assess the caves located prior to or during construction for sensitive/endangered species and provide further consultation before activities proceed.

6. No blasting should be permitted in the vicinity of any known karst features without previous consultation.

Vehicle Maintenance, Petroleum, and Chemicals

To prevent petroleum products from contaminating soils and water bodies, the following BMPs should be implemented:

* Construction equipment and vehicles should be properly maintained to prevent leaking of petroleum products.

* Specific staging areas for equipment/vehicle maintenance and chemical storage should be established 100 yards or more away from wetlands, streams, or karst features.

* Drip pans and tarps or other containment systems should be used when changing oil and other vehicle and equipment fluids.

* Any contaminated soils or materials should be disposed of off-site in proper receptacles or at an approved disposal facility.

* Vehicle and equipment fueling should be attended at all times by site personnel. Spill cleanup materials should be stored on site and employees should be trained in spill control procedures.

* Wash water (including mild detergents) from the body of vehicles should be allowed to infiltrate into a permeable area such as gravel, grass, or loose soil 300 feet or more from

wetlands, streams, or karst features. Vehicle engine or under-body and equipment wash water should be disposed of off-site at appropriate facilities depending on the contents of the waste water. Waste water should not be discharged directly into water bodies or karst features.

* Petroleum products and other chemicals should be properly stored in appropriately labeled containers under sheltered areas. Storage shelters should be designed with an impermeable floor area.

* Materials for cleaning up spills should be kept on site. Spills should be cleaned up immediately in accordance with state and federal regulations.

Solid Wastes

Solid wastes, such as vegetation removed during clearing, sanitary waste, food and food container waste, and metal and wood scraps, should be collected and disposed of according to applicable regulations or recycled/reused. Sanitary facilities should be well maintained and conveniently located. Waste containers should be labeled and located in a sheltered area away from water bodies and drainage pathways. Erosion and sediment control structures should be frequently inspected for accumulations of solid waste and any waste removed immediately.

Chemical Controls

Herbicides, fertilizers, vehicle maintenance fluids, petroleum products, and drilling fluids should be discarded, stored, and/or changed in staging areas established as far away from streams as is economically and physically possible. Spill response protocols and a spill response kit should be maintained on site to address these concerns.

Areas where discharge material, overburden, fuel, and equipment are stored should be designed and established at least 300 vegetated feet from the edge of streams and cave watersheds. Further distance is recommended, but with proper barrier fences, surface design, and/or maintaining a vegetated buffer, most impacts can be avoided or significantly reduced.

Stream Crossings/Pipelines

Several methods could be used for stream crossings, including open cut channels and directional drilling. The standard BMPs for pipeline construction in trenches, construction near sensitive areas, and construction staging areas should be applicable to each of these water crossing methods. Construction at stream crossings should be according to the selected stream crossing method (wet trench, dry trench, or drilling) and specific mitigation concerns associated with the level of disturbance and stream sensitivity. General construction sequences for trenched stream crossings include the following basic steps:

1. Construct a flow by-pass structure (for dry trenching) to create a relatively dry stream bed or a backwater condition. Flow by-pass structures should cross the full width of channel (including side channels) in one span or in stages;

2. Once flow is controlled (in the case of wet trenching, step one above is not needed), route flow into the by-pass and trench across the entire channel width to the appropriate depth below maximum scour and install pipeline;

3. Backfill the trench with native bed material, and stabilize the bed and bank with armoring matched to baseline flow conditions;

4. Re-introduce flow and monitor performance.

Temporary in-stream settling ponds should be constructed without significantly dredging or altering the natural geology and channel of a stream. Settling ponds should be constructed using primarily fill rock or screens and disturbance or alteration of the channel should be kept to a minimum. Natural stream bed alteration necessary for diversions should be kept at a minimum and restored upon completion of activities. Riprap and filter screens used to create traps or diversions should be removed upon completion of the activities.

Critical slopes are characterized as steep approaches to stream crossings where the pipeline trench is parallel to the slope angle, areas where bank erosion can destabilize slopes, drainage is concentrated, and areas where sediments can directly enter receiving waters. Stringent erosion and sediment control measures, aggressive slope stabilization measures, and frequent monitoring should be implemented during and after construction in critical areas.

Use a directional drilling method for proposed pipeline crossings of sensitive losing streams, flowing streams, and wetlands. Prior to directional drilling, a geotechnical investigation using the least intrusive means possible (e.g. ground penetrating radar, minimal exploratory bore hole drilling, seismic refraction and reflections, cave radio, resistivity, magnetometry, etc.) should be conducted to determine subsurface/geologic conditions that would be encountered along the drill path to ensure that a directional drill pipeline at the location would be feasible and not result in unnecessary damage to a sensitive area, such as a karst void. Drilling fluids should be captured and accounted for during all drilling activities.

If directional drilling is not feasible, it is recommended that stream crossings be conducted during periods of low flow (July-September), and that limited amounts of riparian vegetation be removed during pipeline installation.

In general, stream channel disturbance using directional drilling is greatly reduced compared to trenching. Considerations include preventing runoff and contaminants from the staging areas on either side of the crossing from entering the stream. This should require construction of secondary containment structures (i.e. berms and filter fences) along with runoff dispersion and sediment traps to prevent any runoff generated in the staging areas from reaching the stream. Additionally, equipment should not be run through stream channels.

Where excavation involves native or established wetland/riparian vegetation, the top 6-12 inches or more of vegetation and topsoil including the vegetation and root mass should be carefully removed and stockpiled separately into a dedicated deposition area. After completion of site disturbance this vegetated material and its associated soils should be placed as the surface material.

Wells located within the ROW should be evaluated for closure methodology and potential biological inventories. Wells adjacent to the ROW should be documented for future monitoring

opportunities. If wells are located within the ROW which require closure, coordination with the USFWS should occur prior to closure.

Stormwater

Stormwater concerns occur during construction and after the landscape is stabilized and developed. In fact, threats to groundwater shift from sediment, fuels, and oil/grease from construction sites, to lawn chemicals, oil and grease from personal vehicles, and other household contaminants. Plans should be made to address post construction stormwater contaminants.

The Arkansas Department of Environmental Quality and the Environmental Protection Agency oversee and permit stormwater runoff. In 2003, the Northwest Arkansas Regional Planning Commission developed the Northwest Arkansas Stormwater Quality Best Management Practices Preliminary Guide Manual for community use. The manual was developed with six control measures including public education and outreach, public participation and involvement, illicit discharge, detection and elimination, construction site runoff control, post-construction runoff control, pollution prevention, and good housekeeping. When open land is developed the hydrology of the site completely changes. Possible contaminants associated with development include sediment, nutrients, microbes, organic matter, toxic contaminants, trash, and debris. Each of these together or separately can pollute groundwater. Once contaminants leave the site and enter drainage within a groundwater recharge zone, whatever the water was carrying is now contributing to groundwater pollution and can threaten rare karst animals.

Please contact Jeff Hawkins Director of the Northwest Regional Planning Commission at 406 N. Shiloh, Springdale, Arkansas 72764 or call him at 479-751-7125 for a copy of their stormwater BMPs. BMPs summarized above are presented in greater depth in this publication.

Stormwater Detention Basins

Stormwater runoff potentially contains sediments, fuels/oil/grease, brake dust, herbicides, pesticides, and other contaminants. In order to reduce the quantity of potential contaminants contained in stormwater during and after construction activities, the following recommendations apply:

* Establish a stormwater detention basin capable of capturing sediments off the development. This detention basin can be roughly established initially then refined once construction is completed and the site stabilized

* Before construction begins, a detention basin should be designed and constructed to capture the first ½ inch of a rain/climatic event from the entire site proposed for development. These basins should be fenced and contain a 3:1 slope for safety reasons. The basin should not be constructed in a stream drainage, but may be constructed adjacent to it. A spillway should be established in the detention basin to allow for rain/climatic events in excess of ½ inch to be discharged based on state permitting. The bottom of the pond should be lined with a textile or bentonite type material to capture the rain and not allow leakage. This should then be covered by approximately 1-2 feet of gravel, so that during maintenance the impenetrable lining would not be breeched.

* A sediment monitoring station should be established in the detention basin to determine the rate of filling and to determine when excess sediment should be removed from the pond. At a minimum, at least once a year the pond should be inspected for trash and debris. Any visible trash or debris shall be removed. At a minimum, at least every five years the pond shall be drained, the sediment monitoring station checked, and if necessary the pond dredged to its original depth. Removed sediments should be discarded in an appropriate location where surface erosion potential is negated as it possibly contains concentrated contaminants.

* An alternative to detention basins could be the installation and maintenance of an oil/grit/water separation system. An example can be found on the internet at baysaver.com. Although these systems would replace detention basins, discharge would still need to run through a bioretention treatment area, as described below.

* After capture of the first ½ inch flush, waters should then be directed to a bioretention treatment area which consists of a vegetated buffer strip, sand bed, organic or mulch layer, planting soil, and hydrophilic plants. This area provides temporary storage prior to infiltration. Plants can remove contaminants while a clay layer can absorb hydrocarbons, heavy metals, nutrients and other contaminants. Organic mulch filters contaminants and provides an environment conducive to growth of microorganisms, which degrade petroleum based products and other organic materials. Bioretention areas require maintenance.

In areas where sensitive karst features are identified or a stream corridor exists which are the target of stormwater discharge, a stormwater detention basin should be constructed as a permanent on-site structure to allow for settling of contaminants. In addition, before stormwater flows out of these basins and into the stream corridor, it should run through some variation of a constructed bioretention filter. This filter can remove and trap many of the floating contaminants that wouldn't be trapped by a detention basin (i.e.; oil/grease).

Another possible alternative for treatment of stormwater are separation systems. These systems allow for sediment, oils, and floatable debris to be collected. They do require periodic maintenance, but may provide a reasonable alternative to large detention basins. While these systems do reduce some contaminants, outflow from the systems should run through a constructed bioretention filter to remove other contaminants.

The best alternative is to connect the development into an established community stormwater collection system which transfers and discharges the waters to an appropriate permitted location. All regulations established and required by the Arkansas Department of Environmental Quality must be followed.

Wastewater

Several alternatives for managing wastewater are either currently available or possible in the future. These include regional or municipal sewage treatment plants, decentralized wastewater treatment facilities, or septic systems. Currently, only the latter two are available for much of the Cave Springs Cave recharge zone. Based on the density of most large scale developments, municipal or decentralized wastewater treatment facilities are probably the primary alternatives.

Location of the treatment stations and the placement of the drip fields are of the most concern when it comes to groundwater conservation. Karst landscapes have limited soils and the closer one comes to a sensitive karst feature, generally fewer soils are available to assist in the wastewater treatment process. The Arkansas Department of Health (ADH) must be contacted for both decentralized wastewater treatment facilities and septic systems in order for them to characterize the soils as capable of functioning effectively as part of the treatment process or not. In the case of decentralized wastewater treatment facilities, both the ADH and Arkansas Department of Environmental Quality conduct reviews before permits are issued. Septic systems are reviewed and permitted by the ADH.

Where stream channels are located within the Cave Springs Cave recharge zone, a setback of at least 100 feet should be the minimum for driplines or drainfields. Soils should meet more than the minimum criteria for wastewater detention time, given the fact that karst geology lies just beneath and can transfer contaminants directly to the groundwater.

Decentralized wastewater treatment is generally considered to be an extension of onsite wastewater treatment or conventional wastewater systems that includes some form of voluntary management practices. Decentralized systems employ a combination of technologies and are used to treat and dispose of wastewater from dwellings and businesses close to the source. Decentralized wastewater systems allow for flexibility in wastewater management, and different parts of the system may be combined into "treatment trains," or a series of processes to meet treatment goals, overcome site conditions, and to address environmental protection requirements. Each technology has advantages, as well as limitations, so a treatment technology must be selected specifically to meet local conditions and treatment objectives. Similarly, every community's own financial, physical, and regulatory factors must be evaluated to find the best technology for their circumstances.

Many considerations would determine how close to the source of generation it is practical to place the treatment center. One very important factor is the potential for beneficial reuse of reclaimed water. Other considerations include topography, soil conditions, development density (existing or desired), type of land use, and environmental impacts of the wastewater management function in any given locale.

Management is the key to keeping decentralized treatment systems functioning properly. Management can encompass planning, siting, design, installation, operation, maintenance, and monitoring onsite and cluster systems. Regular inspection and maintenance form the basis of any management program.

Procedures for Subdivisions Using On-site Sewage Disposal

According to the Arkansas Department of Health's RULES AND REGULATIONS PERTAINING TO SEWAGE DISPOSAL SYSTEMS, a subdivision is defined as "land divided or proposed to be divided by a common owner or owners for predominantly residential purposes into three or more lots or parcels, any of which contain less than three acres, or into platted or unplatted units any of which contain less than three acres, as a part of a uniform plan of development."

1. You must contact an authorized Designated Representative to start the process. Designated Representative lists are available at the County Health Department.

2. The Designated Representative will submit the subdivision plans, in triplicate to the County Health Department.

3. The Arkansas Department of Health's Environmental Health Specialist will evaluate the site and write a letter with their findings to the Arkansas Department of Health Engineering Division. Special consideration will be given to sites that may pose a potential problem for ecologically sensitive areas, areas of shallow bedrock, fractured rock formations, and/or other conditions that may adversely affect renovation of wastewater before re-entering the true water table.

4. Following a recommendation from the Environmental Health Specialist, the Engineering Division will write a letter of approval or denial, usually in conjunction with the subdivision's water system, to the property owner. Water supply, treatment, and distribution plans for the subdivision, other than individual wells for each lot, must be prepared by a registered professional engineer and submitted to the Division of Engineering for review and approval. If you have any questions, please contact the County Health Department and speak to an Environmental Health Specialist.

Summary of Septic tanks from EPA website:

> If properly designed, constructed, and maintained, a septic system can provide an effective treatment of household wastewater. Malfunctioning systems can contaminate groundwater that might be a drinking water source or home to rare karst dependent animals. A typical septic system has four main components: a pipe from the home, a septic tank, a drainfield, and the soil. Microbes in the soil digest or remove contaminants from wastewater. A septic tank is buried in a watertight concrete, fiberglass, or polyethylene container. It holds wastewater long enough to allow solids to settle out and oil and grease to float to the surface. It also allows for partial decomposition of solid materials. A T-shaped outlet in the septic tank prevents sludge and scum from leaving the tank and traveling to the drainfield. Screens are also recommended to keep solids from entering the drainfield. Wastewater exits the septic tank and is discharged into the drainfield for further treatment by the soil. Microbes in the soil provide final treatment by removing harmful bacteria, viruses, and excess nutrients.

Procedures for Obtaining an Individual Septic System Permit

The Arkansas Department of Health requires all property owners using individual sewage disposal (septic system) for their property to follow the steps outlined below. You must contact an authorized designated representative to design the individual sewage disposal system or a repair to the individual sewage disposal system. Designated representative lists are available at the county health department. The following steps are in accordance with the Arkansas Department of Health's Rules and Regulations Pertaining to Individual Sewage Disposal Systems:

1. The Designated Representative will submit an application for a PERMIT FOR CONSTRUCTION for the individual sewage disposal system to the Arkansas Department of Health.

2. The Arkansas Department of Health's Environmental Health Specialist will evaluate the design and issue a PERMIT FOR CONSTRUCTION if the submitted application meets all current regulations and is appropriate for the site.

3. If approved, a copy of the permit will be mailed to the property owner at this time.

4. Upon receipt of the PERMIT FOR CONSTRUCTION, the approved individual sewage disposal system may be installed. A list of septic system installers licensed by the Arkansas Department of Health is available at the County Health Department.

5. After installation, and before the system is covered, the property owner and or the licensed installer will contact the Arkansas Department of Health's Environmental Health Specialist to conduct a final evaluation of the system. If the system is approved the Environmental Health Specialist will issue a PERMIT FOR OPERATION.

If you have any questions regarding on-site sewage disposal or septic systems, please contact the County Health Department and speak to an Environmental Health Specialist.

If you have any questions regarding these BMPs and their application, please contact

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