
PROGRAM OVERVIEW

Description of the Program

The core discussion session and each additional discussion session contains the following elements:

- < Activity at-a-glance,
- < Learning objectives,
- < An estimate of how much time is needed to conduct each session,
- < The vocabulary words covered in the session,
- < Materials that will be needed
- < A list of suggested supplemental and evaluation materials to hand out during the session,
- < Suggestions for preparation for facilitators,
- < Suggested presentation, and
- < Directions for session evaluation.

Core Session

[50 minutes: 10 minutes for the icebreaker activity, 20 minutes to show the video, and 20 minutes for discussion]

Participants will watch the companion video on Well Plugging -- Plugging Water Wells in Texas and discuss the main ideas presented. Topics for discussion include the risk of abandoned wells pose to our personal safety and our water resources, what is an abandoned well and how do we fix an abandoned well, who can plug an abandoned well, the six main steps in plugging an abandoned well and the importance of each step.

Additional Discussion Sessions [10 minutes each]

After conducting the core session, you have the option of continuing the group discussion focused on specific topics introduced in the video and briefly discussed in the core program. There are eight additional discussion segments that you may choose from, that further explore:

1. Texas Groundwater Resources Are Critical to Meeting Our Future Water Needs
2. Abandoned Wells Are a Threat to Our Personal Safety and Our Water Supply
3. When Is a Well Considered Abandoned?
4. Who Can Plug Abandoned Wells?
5. What Materials Can Be Used to Plug a Well?
6. Well Plugging Steps
7. How to Calculate the Volume of a Well
8. How to Calculate the Disinfectant Needed for a Well

Description of Additional 10-minute Discussion Sessions

Texas Groundwater Resources Are Critical to Meeting Our Future Water Needs

Participants will discuss future water needs and how groundwater plays into meeting these needs. Additional groundwater resources will be needed in the future. We will develop both fresh and saline groundwater resources.

Abandoned Wells Are a Threat to Our Personal Safety and Our Water Supply

Participants will discuss the threats of abandoned wells to our personal safety and water supply. Abandoned wells are an open hole to fall into and provide a method for contaminated surface water and undesirable groundwater to enter our valuable groundwater resources.

When Is a Well Considered Abandoned?

Participants will discuss the conditions required to be evaluated for determining if a well is considered abandoned.

Who Can Plug Abandoned Wells?

Participants will discuss who has the authority to plug an abandoned well. The types of wells will be discussed to identify the types needing a licensed professional for closure.

What Materials Can Be Used to Plug a Well?

Participants will discuss the different materials used in plugging an abandoned well.

Well Plugging Steps

Participants will discuss and learn the six main steps involved in plugging a well.

How to Calculate the Volume of a Well

Participants will learn how to calculate the volume of a well.

How to Calculate the Disinfectant Needed for a Well

Participants will discuss how to calculate the needed amount of disinfectant for a well.

Supplemental Resources for Facilitators

This section includes tips for advanced planning, preparing the day of the program, enhancing the educational impact of the program, as well as things facilitators can do to optimize groups discussion.

Handouts

This section contains supplemental information for both facilitators and program participants. Contents of this section can be photocopied and used as handouts at training sessions. This section contains: (1) materials that provide background information on the risk abandoned wells possess to our water resources and personal safety; (2) information sheets on how to conduct an abandoned well closure; and (3) a well plugging report form.

Evaluation Materials

Evaluation materials provided in this section include: (1) a survey to assess whether the learning objectives of the program were met; and (2) an answer key to that survey, as well as (3) respective process evaluation sheets for participants and facilitators.

Resources for Further Inquiry

This Facilitator Guide provides an overview of the well plugging process. This section provides a list of contacts for more information on any of the topics discussed in this program. These resources include federal and state agencies, and local ground water conservation districts.

Core Session

Activity at a Glance

Participants will watch the video, “Well Plugging - Plugging Abandoned Wells in Texas.” Participants will discuss the major points conveyed in the video, including: abandoned wells are a threat to our safety and our water resources, identification of an abandoned well and methods for fixing the well, the six key steps in the well plugging process and the importance of each step.

Learning Objectives

Upon completion of this session, participants will be able to:

- < Understand the risk abandoned wells pose to safety and our water resources.
- < Identify an abandoned well.
- < Identify who can plug an abandoned well.
- < Describe three approaches to handling an abandoned well.
- < Identify the six key steps in plugging an abandoned well.
- < Describe acceptable materials for plugging abandoned wells.

Time

50 minutes: 10 minutes for the icebreaker, 20 minutes to show the video and 20 minutes for discussion.

Vocabulary

abandoned well, bentonite, bentonite grout, capped well, casing, plugging, well

Suggested Materials

Handouts

- < Vocabulary
- < Well Plugging Report Form

Evaluation

- < Evaluation Survey Form
- < Participant Program Evaluation Form
- < Facilitator Program Notes Form

Other

- < Chalkboard, flipchart, dry erase board or other means to record and post group responses.
- < Video projector, overhead, tv/vcr.

Advanced Preparation

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- < Watch the video.
 - < Read planning your program and tips for facilitating discussion.
 - < Read all suggested handouts for background information and review the suggested checklists.
 - < Review the vocabulary used in the program.
 - < Select and photocopy supplemental materials to hand out to program participants.
 - < Select and photocopy evaluation materials.

Suggested Presentation

1. Introduction

Introduce yourself, your organization and that you will be facilitating today's session.

- < Today we will discuss abandoned water wells as a risk to our safety and our water supplies, and how we can plug these abandoned wells.

2. Icebreaker - 10 Minutes

- < Ask how many participants in the audience have ever seen an abandoned well by a show of hands. If hands rise, ask them to share a little about the condition of the well, whether it was covered, and how easy would it have been to fall into the well.
- < We will begin by watching a video on how to plug abandoned water wells. This video describes the steps required to plug an abandoned well and the proper materials to be used to plug the well.
- < This video was created through a joint effort by the Texas Cooperative Extension and the Texas Groundwater Protection Committee.

3. Play Video - 20 Minutes

- < After you show the video, reiterate that this video describes the importance of plugging abandoned water wells and how to properly plug a well.

4. Discuss

This discussion session will last for twenty minutes. You will have a limited time to discuss each point and reiterate its importance.

- < Why according to the video are abandoned wells a threat to our personal safety and our groundwater resources?
 - Open hole that a person can fall into and be injured.
 - Provide a direct conduit for surface water to be carried down to the groundwater resource
 - Provide a means for the groundwater from two different aquifers to be mixed.
- < When is a well considered abandoned?

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- If the well is not considered in use for six months.
 - A well is considered in use if it:
 - has a good casing, pump and pump column
 - has a non-deteriorated well casing that has been capped.
- < What are the main plugging materials used to plug an abandoned well?
- bentonite clay
 - cement slurry
 - Hand dug wells can be filled with a good clay soil or caliche soil
- < What are the six key steps in the plugging process and why are these steps important?
- Measure the dimensions of the well.
 - This information is used to determine the volume of material needed to plug the well and the quantity of standing water in the well.
 - Remove all obstructions from the well.
 - This will prevent the plugging materials from reaching the bottom of the well and having the well properly plugged.
 - Disinfect the well by adding household bleach.
 - The household bleach will kill any microorganisms that have fallen into the well while it was open.
 - Remove as much casing as possible.
 - Removing the casing assists in destroying the direct conduit to the groundwater.
 - Fill the well with plugging materials.
 - The plugging materials restrict the water movement from the soil surface to the groundwater. These materials need to be clean to prevent contamination of the groundwater and prevent bridging as the materials enter the well.
 - Complete and file the plugging report.
 - The plugging report provides documentation that the well has been properly plugged. This material needs to be sent to the Texas Department of Licensing and Regulation and local groundwater conservation districts.

5. *Summarize the Major Points*

- < Abandoned wells are a danger for falling into the well and provide a direct conduit for contaminants to reach groundwater.
- < A well is considered abandoned if it is not used for six months and it has a deteriorated casing, or is inoperable.
- < The well will not be considered abandoned if it is capped, returned to an operable status or is plugged.
- < The six key steps in the plugging process.

6. *Optional Discussion*

If you would like to tailor your discussion around a particular topic, you may elect to choose additional segments discussing the one or more of the following:

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- < Texas Groundwater Resources Are Critical to Meeting Our Future Water Needs
 - < Abandoned Wells Are a Threat to Our Personal Safety and Our Water Supply
 - < When Is a Well Considered Abandoned?
 - < Who Can Plug Abandoned Wells?
 - < What Materials Can Be Used to Plug a Well?
 - < Well Plugging Steps
 - < How to Calculate the Volume of a Well
 - < How to Calculate the Disinfectant Needed for a Well

Evaluation

After your discussion, pass out the Evaluation Survey and/or the Participant Program Evaluation form to assess your program objectives. You may choose to complete the Facilitator Program Evaluation form for future program planning. Evaluation forms are located in Section V of this guide.

*Texas Ground Water Resources
Are Critical to Meeting Our
Future Water Needs*

Activity At A Glance

Participants will discuss future water needs and how groundwater plays into meeting these needs.

Learning Objectives

Upon completion of this section, participants will be able to:

- < Discuss Texas's future water needs.
- < Understand the importance of groundwater for meeting these needs.

Suggested Materials

Handouts

- < Informational sheet on water supply

Other

- < Chalkboard, flipchart, dry erase board or other means to record and post group responses.

Vocabulary

aquifer, recharge zone, water or waters in the state

Presentation

Introduction - We will now discuss how Texas ground water resources are critical to meeting our future water needs.

Discuss

- < Why are we experiencing an increasing demand for water in Texas?
Allow them to brainstorm aloud. You may chose to record participant responses onto a flip chart or chalkboard. Before moving on make sure they have discussed how the increasing population will increase our demand for water. Each additional person will need water to meet their needs. Water usage depends on their location within the state.
- < What portion of our water demand is met through ground water? Today and in the future.
Discuss the percentage of our water demand met by groundwater and the total volume supplied by groundwater today and in the year 2050. Get the key data from the fact sheet.
- < Poll the audience on the number of people that use ground water as there water source.

Summarize the Major Points

- < Groundwater plays an important role in meeting future water needs in Texas.
- < Groundwater will be in greater demand in the future.

Abandoned Wells Are a Threat to Our Personal Safety and Water Supply

Activity At A Glance

Participants will discuss the threats of abandoned wells to our personal safety and water supply.

Learning Objectives

Upon completion of this session, participants will be able to:

- < Identify how abandoned wells are a threat to our personal safety.
- < Identify how abandoned wells can endanger our water supply.
- < Identify how plugging the well removes these risks.

Vocabulary

abandoned well, constituents, foreign substance, pollution, undesirable water

Suggested Materials

Chalkboard, flipchart dry erase board or other means to record and post group responses.

Presentation

Introduction - Today we will discuss the possible ways that abandoned wells can threaten our personal safety and our water supply.

Discuss

- < Why is an abandoned well a threat to our safety?
Allow them to brainstorm aloud. You may want to record their responses on a chalkboard or flipchart. The main concern is falling into an open well. Review the handout covering abandoned wells are a threat to our personal safety.
- < According to the video why are abandoned wells such a threat to our water supply?
Allow them to brainstorm aloud. You may want to record their responses on a chalkboard or flipchart. The main methods of contamination include surface water running down the casing, co-mingling of two aquifers, and pressure head loss from water moving from one aquifer to another.
- < Do you agree with this? Why? Why not?
- < What are some steps that could be taken to prevent contamination?
Main method is to remove the abandoned well.

Summarize the Major Points

- < Abandoned wells can provide an easy access to our water supply for contaminants.
- < Abandoned wells are an open hole to fall into.
- < Through proper procedures, the threat of personal injury and contamination can be removed.

When is a Well Considered Abandoned?

Activity At A Glance

Participants will discuss the conditions required to be evaluated for determining if a well is considered abandoned.

Learning Objectives

Upon completion of this section, participants will be able to:

- < Determine if a well is considered abandoned.

Suggested Materials

Chalkboard, flipchart, dry erase board or other means to record and post group responses.

Vocabulary

abandoned well

Presentation

Introduction – We will now discuss how to determine if a well is considered abandoned.

Discuss

- < According to the video when is a well considered abandoned?
Allow them to brainstorm aloud. You may chose to record participant responses onto flip chart or chalkboard. A well is considered abandoned if it is not **in use** for a period of six months. A well is considered in use if it (1) is in good condition with active components, and (2) is a well with a good casing and capped.
- < Why would the two criteria for fixing an abandoned well be appropriate?
 1. A well in good condition is not a risk to people or the ground water resources. Good casing prevents groundwater mixing and pressure loss, good pump and column should seal the top of the well.
 2. Good casing and capped: prevents mixing of groundwater and capped casing prevents people from falling into the well and surface contaminants from entering the well.
- < Poll the audience to see if anyone has encountered abandoned wells.
Allow them to brainstorm aloud. How would their experiences have protected or been a risk to people or the groundwater resource?

Summarize the Major Points

- < According to state law a well is considered abandoned if it has not been used for six consecutive months. However a well can be considered in use if
 - a non-deteriorated well that contains the casing, pump, and pump column in good condition, or
 - a non-deteriorated well that has been capped.

Who Can Plug an Abandoned Well?

Activity At A Glance

Participants will discuss who has the authority to plug an abandoned well. Well construction techniques will be discussed for the purpose of understanding critical differences requiring special expertise when plugging the well.

Learning Objectives

Upon completion of this session, participants will be able to:

- < Identify who can plug an abandoned well.
- < List what types of wells the landowner can plug, and the types that require a licensed well driller.

Suggested Materials

- < Chalkboard, flipchart dry erase board or other means to record and post group responses. to record group responses.

Vocabulary

casing, well,

Presentation

Introduction - Today we will talk about who has the authority to plug an abandoned well.

Discuss

- < What are the common construction methods used to construct water wells. *Review the handout covering common construction techniques.* Discuss the differences between the eight types of wells. The keys points are diameter, uniformity of casing diameter, cemented casing, depth.
- < According to the video what type wells can the landowner plug himself?
Allow them to brainstorm aloud. You may want to record their responses on a chalkboard or flipchart. The landowner can plug type I-V wells, assuming there is less than 100 feet of standing water in the well.
- < Even with a type I-V well, why might it be better to hire a contractor?
Allow them to brainstorm aloud. Before moving on to the next question make sure they understand a contractor may have better equipment and understanding of the geology conditions that affect how the well should be plugged.

Summarize the Major Points

- < Landowners have the authority to plug type I-V wells if there is less than 100 feet of water in the well.
- < Only licensed well drillers should plug type VI-VIII wells.
- < In some cases it may be better to hire a contractor for type I-V wells.

What Materials Can Be Used to Plug a Well?

Activity At A Glance

Participants will discuss the different materials used in plugging an abandoned well.

Learning Objectives

Upon completion of this section, participants will be able to:

- < Identify the proper materials used to plug abandoned wells.
- < Understand the characteristics of the plugging materials for preventing the transport of surface water to groundwater.
- < Understand the importance of using clean materials.

Vocabulary

cement, bentonite, bentonite grout

Suggested Materials

Chalkboard, flipchart, dry erase board or other means to record and post group responses.

Presentation

Introduction - We will now discuss the different materials used to plug abandoned wells.

Discuss

- < According to the video what materials are used to plug abandoned wells?
Allow them to brainstorm aloud. Before moving on to the next question be sure that they have covered cement, Bentonite chips, Bentonite grout, and compacted clay or caliche for large wells.
- < What are some of the reasons behind using these materials?
Allow them to brainstorm aloud. Before moving on to the next question be sure that the participants recognize the need to use a slowly permeable material to prevent contaminated surface water from reaching groundwater and mixing of multiple groundwater sources.
- < Why should you use potable water when mixing cement or Bentonite grout?
Allow them to brainstorm aloud. Before moving on to the next question be sure the participants recognize the risk of adding contaminants to closed wells by mixing the plugging materials with contaminated water.

Summarize the Major Points

- < The different acceptable materials used to plug abandoned wells are cement, Bentonite chips, and Bentonite grout.
- < When plugging a large diameter well, clay or caliche soil may be used.
- < The plugging materials provide a barrier to prevent rapid movement of surface water down to the aquifer and the mixing of water between different aquifers through the well casing.

Well Plugging Steps

Activity At A Glance

Participants will discuss and learn the six main steps involved in plugging a well.

Learning Objectives

Upon completion of this session, participants will be able to:

- < Describe the six steps that should be taken when plugging a well.
- < Understand the importance of each step for protecting groundwater resources

Suggested Materials

Handouts

- < Well Plugging Steps
- < Well Construction Methods

Other

- < Chalkboard or flipchart to show example of calculations.

Vocabulary

annular space, casing, groundwater conservation district, TDLR, well

Presentation

Introduction - We will now go through the key six steps used to plug a well.

Discuss

- < What are the six main steps used to plug a well?
Allow them to brainstorm aloud. Record responses so that everyone can see them. Before moving on make sure that they have described: Determining the size of the well, removing debris from well, disinfecting the well, removing as much casing as possible, filling the well with plugging materials and completing and filing the state plugging form.
- < Why is each step of the plugging process important?
Determining the size of the well - Allows an accurate estimation of plugging materials needed to fill the well and quantity of disinfectant for disinfection of standing water.
Removing debris from the well - Prevents plugging materials from bridging, thus not allowing the casing to be completely filled.
Remove as much casing as possible - Removes the conduit for carrying contaminants down to groundwater.
Filling the well with plugging materials - Water can not go down through the bore hole because it is filled with a slowly permeable material.
Completing and filing a plugging report - informs regulatory agencies of the properly closed well.
- < Who should you contact when considering plugging a well?
Allow them to brainstorm aloud. You may choose to record participant responses onto flip chart or chalkboard. Before moving on make sure they have covered state and local groundwater districts, licenced well driller in the area

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- < Where are these authorities located?
Allow them to brainstorm aloud. Review information in Resources for Further Inquiry section
 - < What are some of the common misconceptions when plugging a well?
Brainstorm with the class participants. Ex. Just dump materials into the well until it is full.
You can fill the well with trash.

Summarize the Major Points

- < When considering plugging a well, you should contact your local groundwater conservation district and a local licenced well driller.
- < Before starting the plugging procedure you should have an understanding of the geology of the area and the type of well to be plugged.
- < The six key steps in the plugging process - Determining the size of the well, removing debris from well, disinfecting the well, removing as much casing as possible, filling the well with plugging materials and completing and filing the state plugging form.

How to Calculate the Volume of a Well

Activity At A Glance

Participants will learn how to calculate the volume of a well.

Learning Objectives

Upon completion of this session, participants will be able to calculate the volume of a well.

Suggested Materials

Handouts

- < Well Plugging Steps

Other

- < Blackboard, flip chart, or overhead projector to work example problem.

Vocabulary

abandoned well, casing, mud, well

Presentation

Introduction - In this portion we will learn how to calculate the total volume of a well.

Discuss

- < According to the video what dimensions are needed in order to accurately calculate the volume of a well?

Record participants responses on the overhead projector, flip chart or chalk board. The responses should include the well diameter, total well depth, and depth to the water.

- < What is the common procedures for measuring these dimensions?

Record participant responses. A tape measure is commonly used for well diameter. Well depth can be measured with a string with a lead fishing weight on the end. The string is lowered into the well, pulled out, and the total length in the well is recorded. The water depth can be measured by recording the length of wet line.

Summarize the Major Points

- < Total depth and diameter are needed for calculating volume of a well
- < Calculating the proper volume of the well is a very important step to insure the proper quantity of plugging materials and disinfectant.

How to Calculate the Disinfectant Needed for a Well

Activity At A Glance

Participants will discuss how to calculate the needed amount of disinfectant for a well.

Learning Objectives

Upon completion of this session, participants will be able to analyze a well and calculate the proper amount of chlorine needed for disinfection.

Suggested Materials

Handouts

- < Well Plugging Steps

Presentation

Introduction - We will now take a closer look at calculating the disinfectant needed for a well.

Discuss

- < What chlorine concentration is needed to obtain disinfection?
Allow them to brainstorm aloud. The desired concentration is 100 part-per million. This concentration can be obtained by adding 1 gallon of bleach per 500 gallons of water. Adding of addition bleach is not a problem. This may be desirable if the water in the well has organic matter in it.
- < What is the common type of disinfectant?
Chlorine bleach. Use the non scented products. Usually, the products contain 5.25% solution.
- < How do I determine the quantity of need chlorine product?
Use the calculation table in the guide or calculate directly.

Summarize the Major Points

- < The needed amount of chlorine can easily be found by using the disinfection calculation table.
- < The desired chlorine concentration is 100 parts-per-million.
- < We use the disinfectant to remove bacteria from the well water.