Vocabulary Graphic Organizer

Vocabulary Word	*Part of Speech*	*Definition*
site	**noun**	**a location on which something is built**
Teacher Example*: *(Underline the vocabulary word)		
The city of Los Alamos was chosen as the site to build a top secret laboratory for the atomic bomb.		
***Your Sentence*:**		

Vocabulary Word	*Part of Speech*	*Definition*
deploy	**verb**	**to move into a position of readiness for military action**
Teacher Example*: *(Underline the vocabulary word)		
Over many protests, the President gave the order to deploy the bomb over Japan.		
***Your Sentence*:**		

Vocabulary Word	*Part of Speech*	*Definition*
industrial	**adjective**	**relating to industry (factories and businesses)**
Teacher Example*: *(Underline the vocabulary word)		
Since she was a young girl, Sophia wanted to become an industrial engineer for the military.		
***Your Sentence*:**		

Vocabulary Word	*Part of Speech*	*Definition*
conceived	**verb**	**to form an idea or plan**
Teacher Example*: *(Underline the vocabulary word) **Sophia conceived an idea that would make it easier for the military to deliver the bomb on its exact target.**		
***Your Sentence*:**		

Vocabulary Word	*Part of Speech*	*Definition*
fission	**verb**	**the process in which the nucleus of an atom splits apart and releases energy**
Teacher Example*: *(Underline the vocabulary word) **Scientists needed to control the fission process of the uranium material in the bomb in order to prevent it from exploding too soon.**		
***Your Sentence*:**		

Vocabulary Word	*Part of Speech*	*Definition*
concurrently	**adverb**	**happening at the same time**
Teacher Example*: *(Underline the vocabulary word) **U.S. scientists were working on plans to design a bomb while German scientists were doing so concurrently in their laboratories in Berlin.**		
***Your Sentence*:**		

Vocabulary Word	*Part of Speech*	*Definition*
gaseous	**adjective**	**consisting of gas, not a solid or a liquid**
Teacher Example*: *(Underline the vocabulary word) **As the liquid chemicals boiled, Sophia had to be careful to not breath in the gaseous vapors.**		
***Your Sentence*:**		

Vocabulary Word	*Part of Speech*	*Definition*
operating	**verb**	**to work, perform, or function**
Teacher Example*: *(Underline the vocabulary word) **Eventually, Sophia's idea was accepted by the military so she could begin operating on her big project.**		
***Your Sentence*:**		

Vocabulary Word	*Part of Speech*	*Definition*
established	**verb**	**to set up or settle in a position or place**
Teacher Example*: *(Underline the vocabulary word) **The military base had been established there to protect Americans from enemy attacks.**		
***Your Sentence*:**		

Vocabulary Word	*Part of Speech*	*Definition*
personnel	**noun**	**workers in a business or organization**

Teacher Example*: *(Underline the vocabulary word)

After many years of hard work, Sophia's dream to become part of the elite military personnel team finally came true.

***Your Sentence*:**

Name_____ **Vocabulary Quiz**

Directions: Match the vocabulary word to its definition.

Vocabulary Word	Definition
_____ 1. gaseous	A. the process in which the nucleus of an atom splits apart and releases energy
_____ 2. established	B. to move into a position of readiness or for military action
_____ 3. fission	C. consisting of gas, not a solid or a liquid
_____ 4. deploy	D. relating to industry (factories and businesses)
_____ 5. industrial	E. to set up or settle in a position or place

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_____ 6. personnel	A. a location on which something is built
_____ 7. operating	B. happening at the same time
_____ 8. site	C. workers in a business or organization
_____ 9. conceived	D. to work, perform, or function
_____10. concurrently	E. to form an idea or plan

Vocabulary Quiz **Answer Key**

__C__ 1. gaseous
__E__ 2. established
__A__ 3. fission
__B__ 4. deploy
__D__ 5. industrial

__C__ 6. personnel
__D__ 7. operating
__A__ 8. site
__E__ 9. conceived
__B__ 10. concurrently

Background v.2 "The Manhattan Project"

"The effects could well be called unprecedented, magnificent, beautiful, stupendous and terrifying. No man-made phenomenon of such tremendous power had ever occurred before. The lighting effects beggared description. The whole country was lighted by a searing light with the intensity many times that of the midday sun. It was golden, purple, violet, gray and blue. It lighted every peak, crevasse and ridge of the nearby mountain range with a clarity and beauty that cannot be described but must be seen to be imagined. It was the beauty the great poets dream about but describe most poorly and inadequately." **-- Brigadier General Thomas F. Farrell, Deputy Commander to General Leslie R Groves**

"We knew the world would not be the same. A few people laughed, a few people cried, most people were silent. I remembered the line from the Hindu scripture, the Bhagavad-Gita. Vishnu is trying to persuade the Prince that he should do his duty and to impress him takes on his multi-armed form and says, 'Now, I am become Death, the destroyer of worlds.' I suppose we all felt that one way or another." **-- J. Robert Oppenheimer, Scientific Director of the Manhattan Project**

1 On July 16, 1945, the United States **detonated** the world's first atomic bomb at the Trinity site in the New Mexico desert. The **detonation** was the key test of a top secret effort, code named the Manhattan Project to build and deploy atomic weapons in time to affect the outcome of World War II. Carried out by the Army under the direction of General Leslie R. Groves, it was the largest and boldest combined scientific and industrial effort ever attempted.

2 The project was conceived in 1939 when Albert Einstein wrote to President Franklin Roosevelt of the urgent need to develop nuclear weapons. Einstein warned that German scientists had begun research on an atomic bomb. The atom had been split for the first time in a Berlin laboratory in 1938. The **principle of nuclear fission** was generally understood by the world's scientific community. Prewar atomic research was limited in the United States. However, Enrico Fermi and his colleagues at the University of Chicago's **Metallurgical** Laboratory produced the world's first **sustained nuclear reaction** in December 1942.

3 While the construction of an atomic bomb was considered scientifically **feasible**, the technology for producing fissionable material was unknown. Methods for using the material to make a bomb were largely unexplored by American scientists. Two fissionable materials for the bomb were considered: uranium-235 and plutonium-239. Scientists at the University of California at Berkeley, at Columbia University, and at a specially formed secret organization called Kellex carried out research on separating the **isotope** U-235 from the naturally occurring element U-238. Concurrently, the University of Chicago conducted research on plutonium.

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detonated/detonation - exploded/explosion
principle of nuclear fission - the process in which uranium breaks up into two lighter atoms and emits radioactive products, 2-3 neutrons, and releases large quantities of energy.
Metallurgical – expertise with the science and technology of metals
sustained nuclear reaction - the chain reaction effect of fission observed with "pure" uranium
feasible – able to be done successfully
isotope - the forms of an element that differ in the number of neutrons in an atom

4 In 1943 and 1944, a huge **facility** for the separation of U-235 was constructed at Oak Ridge, Tennessee. It had two sites, one for separation by the electromagnetic process, and one for the separation by gaseous (and later thermal) diffusion. The Oak Ridge facility covered 54,000 acres and, at its peak in May 1945, employed 82,000 people. Concurrently, another giant **industrial complex** was built at Hanford, Washington, for plutonium production. It occupied a 600 square mile area and employed over 45,000 people.

5 Numerous industrial and engineering firms were involved in building and operating the **electromagnetic separation** plant at the Oak Ridge site. Major industrial firms were also involved in the construction of plants using **gaseous and thermal diffusion processes**. The Dupont Corporation built and managed the plutonium plant at the Hanford site.

6 Meanwhile, a secret scientific laboratory under the direction of **J. Robert Oppenheimer** was established at Los Alamos, New Mexico, to design and assemble the actual uranium- and plutonium-based atomic weapons. The laboratory site was selected in late 1942 and the first **contingent** of scientists arrived in March 1943. By June, 250 scientific personnel were at work on the bomb's development. Two dozen scientists who had been performing related work in Britain, later joined the Los Alamos effort under a secret agreement between President Roosevelt and British Prime Minister Churchill. At war's end, the work force at Los Alamos numbered over 2,500.

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facility – building
industrial complex – a group of buildings that house production plants, labs and offices
electromagnetic separation – process that uses magnetic fields to separate out the more fissionable U-235 isotope from the U-238
gaseous and thermal diffusion processes – two methods used to separate out the fissionable U-235 istotope. (One process forced gaseous uranium through membranes while the other used heat transfer to force separation.)
J. Robert Oppenheimer – Theoretical physicist who was the highly respected scientific director of the Manhattan Project. Under his guidance, the Los Alamos site was constructed, top scientists collaborated to create the atomic bomb, and all manner of theoretical, mechanical, and day to day problems were managed.
contingent – group

This reading contains excerpts from the "Written Historical and Descriptive Data" section of the Trinity Site Report, HAER No. NM-1A. by Historian William A. Brenner, AIA, in November 1985.

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, D.C. 20013-7127

http://lcweb2.loc.gov/pnp/habshaer/nm/nm0100/nm0139/data/nm0139data.pdf

Paragraph Frame: Geography

What geographic features influenced the site's selection

The geographic features shown on the site map of *(secret city's name)* include several that influenced its selection for the Manhattan Project. Among the first of these would be *(1st geographic feature)* which *explain how this feature made the site favorable*. Next, would be *(2nd geographic feature)* which *explain how this feature made the site favorable*. Finally, the existence of *(3rd geographic feature)* made *(name of city)* an ideal choice as one of the secret cities because *explain how this feature made the site favorable*. In conclusion, the combination of the geographical features of *(1st geographic feature)*, *(2nd geographic feature)*, *and (3rd geographic feature) contributed to the selection of (secret city's name)* as one of the key Manhattan Project sites and the overall success of its mission to create the world's first atomic bomb.