Proposal

Summary

The Iron Works at Glendale was started in 1773. Known both as Wofford's Iron Works and Buffington's Iron Works, it was one of the first manufacturing enterprises in all of Upstate South Carolina. It was an important step in the development of the iron industry in the state. The iron industry spread throughout the Piedmont and some facilities, including one at Glendale, lasted until after the Civil War. The Iron Works played a part in the American Revolutionary War and a battle actually took place at and around the facility.

A case can be made that the first Iron Works at Glendale contributed materially to the rise of the South Carolina textile industry. The success of the Iron Works in using the water power of Lawson's Fork Creek led to the construction of the Bivingsville Textile Mill in the early 1800's. Bivingsville was built also on Lawson's Fork Creek, close to the Iron Works. It was once the largest textile operation in the Piedmont area. The Bivingsville Mill, under various names, was in continuous operation until 1961, a period of over 125 years. The success of the Bivingsville mill was an element in the advancement and proliferation of textile mills all over upper South Carolina and even into neighboring states.

Over the last 25 years, or so, most of South Carolina's textile industry has disappeared. Many, many communities like Glendale have been affected both economically and culturally by the death of the textile industry. It is the intent of this proposal to utilize the concept and story of the Iron Works to help mitigate the negative affects of losing the textile industry on the town of Glendale.

Proposal - Establish a real size, operational, colonial Iron Works at Glendale. This replica should resemble the first one in size and operation as much as possible. The new Iron Works would have an enormous potential both as a tourist attraction for economic development and as an educational resource for students from all over South Carolina.

Background

Iron tools and other implements were badly needed by the new settlers in Upstate South Carolina. Fortunately, all of the necessary parts of the iron making process were available at the place that was to eventually become the town of Glendale. There was water power to turn a water wheel and power a bellows to operate the forge. There was iron ore along the banks of the creek. There was limestone available for the digging and there was a vast number of trees to be turned into charcoal. The iron industry was to be very important in the history of Glendale.

In 1773, Joseph Buffington, iron master, erected an Iron Works or bloomery, as it was known then, on Lawson's Fork. He also met with encouragement from the inhabitants, who were glad to be able to buy tools and other farm implements at home, and equally glad to find a cash market for their wood. Almost every farmer had a pit for burning charcoal to sell at the iron works.

The lands Buffington bought and leased for his plant lay in the region claimed by North and South Carolina before the running of the boundary line in 1772, and he had much trouble about

his titles, for William Wofford had established his claim to the iron works tract on the basis of North Carolina grants. Buffington apparently operated with borrowed capital, and soon lost control of the iron works, which became known as Wofford's Iron Works, and kept that name in popular speech until burned by Bloody Bill Cunningham during the Revolutionary War in November 1781. After that it was for a time called the "old iron works."

In 1776 Buffington borrowed more than 6,000 pounds from the State to complete his plant. William Henry Drayton and many local patriots of influence endorsed his request for this loan, because they knew that iron goods were necessary to the conduct of war. It is noteworthy that, at this and other iron works built later in Spartan District, weapons and ammunition were manufactured for use in the Revolutionary War, the War of 1812, the Mexican War, and the War Between the States.

In 1778 William Wofford sold a three-fourths interest in the iron works built by Buffington to Simon and John Berwick and Charles Elliott of Charles Town, and for a brief time the name "Berwick's Iron Works" was used. The record of when the works were rebuilt and how Buffington regained control of the plant has not been found, but in 1785 an act of the legislature ordered the sale of Buffington's Iron Works, to satisfy the unpaid debt on them. Possibly at this sale William Poole acquired the works, for there can be little doubt that this same site (which is today Glendale) was that of Poole's Iron Works.

The iron industry continued on at Glendale even after the coming of the textile mill. It did not end until after the Civil War. A large cupola furnace at Glendale was used during the War to make bowie knives, swords, shot, shells tools and all sorts of special equipment. Other iron industry plants in the Upcountry were also involved in making supplies for the Confederate war effort. At the end of the War, iron making was discontinued at Glendale. This important industry had served the Upcountry for over 90 years and through two major wars.

Today, the iron industry and its contribution to the state of South Carolina are almost forgotten.

Project Management and Specialized Metallurgy Consultants

Due to its unique nature, this project will require an approach different than most engineering construction jobs. It will be crucial that knowledgeable consultants in the methods and procedures of making iron during the colonial period be involved in every aspect of the project starting with the investigation phase. Conventional project management techniques can be used but only with the continuous input from the iron making consultants. A critical duty of the Project Management and the special consultants will be to make sure that the information found in the Phase 1 - Investigation phase is incorporated into every other part of the project. Possible consultants are listed in the “Internet Sites” under “Sources and References” on page 7.

Objectives and Task Sequence of this Proposal

Phase 1- Investigation

The first Iron Works at Glendale does not seem to be well documented as to how it was actually built and operated. The beginning and most important part of the Iron Works re-establishment will be a serious investigation of the Iron Works itself. Historical accuracy, as much as possible,

is necessary to lend credibility to the final project. The following points and questions will need to be researched and answered, if possible. This research should consist of both an on site archeological investigation and a thorough search in historical references and archives. It is known that due the passage of time and the scarcity of records that many of these questions can never be fully answered.

A. Exactly where was the Iron Works located? - There is still some doubt about the placement of the original Iron Works. Part of the confusion is that the iron industry at Glendale continued until after the Civil War. In later years, some of this industry was in the vicinity of where the textile mill was located. This proposal only covers a replica of the first Iron Works bloomery forge. Preliminary evidence and community sources say that this was located about one half mile upstream from the present textile site. Ideally, the site of the first Works must be determined along with what buildings there were and how they were situated in relation to each other.

B. What sort of iron making operations was conducted at the first Iron Works? - Due to its early age and remote location, the first Iron Works is believed to have been a simple bloomery forge. These were small operations that could only produce about 100 pounds of malleable, wrought iron per day. However, there were more advanced operations in other states at this time that used furnaces, not forges, and produced molten "pig" iron that could be cast. Furnace operations were larger, more expensive and required more labor than the simple bloomery forge. It is known that there were later facilities at Glendale that produced cast iron. However, it is believed that the first Glendale operation was a forge that produced a small amount of wrought iron. However, one possible argument against the simple forge installation is the large sum of money, 6000 pounds, that Buffington borrowed from the state of South Carolina in 1776. This was a considerable sum of money to be used for a simple forge installation. Research will be needed to settle this issue. The replica of a furnace operation would be considerably more complex and expensive than the replica of a forge.

C. Where did the "ingredients" to make the iron come from? - There are three essential components needed to make iron. They are iron ore to provide the element iron, charcoal to be used as fuel and limestone to be used to remove the impurities from the final iron product. It is believed that the iron ore used is what is known as "bog iron". This is present along many of the streams and creeks in Upstate South Carolina. Charcoal is produced by burning hard wood in pits without sufficient oxygen for full combustion. This concentrates the carbon in the wood and the fuel burns much hotter than plain wood. The limestone must be dug out of the ground, broken up into small pieces and then crushed to be used in the process. The investigation will try to find where each of these components were mined or processed at Glendale. It will also attempt to determine, if possible, how much of each was used.

D. Where and how were the ore, charcoal and limestone stored while waiting to be used in the forge?

E. How was the ore, charcoal, and limestone transported and loaded into the forge? - In the process known as "charging", the ingredients are placed into the top of the forge in definite

amounts and arrangement. Depending on the size of the forge, there may have been an inclined ramp for workers to use to get to the top of the forge and to dump their materials.

F. Where was the waterwheel for the forge and what was its size and shape? - There is a chiseled trench in the solid rock in the suspected Iron Works location upstream from the textile mill site. This trench is believed to be the location for the water wheel that powered the mill. In the early 1970's some remains of the handmade wrought iron pieces, believed to retain the waterwheel in place, still existed. This was anchored into the rock right beside the trench. At least one of these iron pieces still exists.

G. What was the size and location of the bellows and how was it connected to the waterwheel? - This question, along with the question as to whether or not there was a structure to protect the bellow from the weather, needs to be resolved. This information may have to be based on studying other similar Iron Works.

H. Where was the forge, how was it built and how big was it? The forge had to be built close to the creek because of the waterwheel but it could have varied in size and type of construction. It also needs to be determined if the forge was housed in some sort of shelter.

I. What provisions were made for reheating and hammering the ingot produced by the forge and then making it into iron bars or plates? The reheating and repeated hammering of the final ingot were important steps in making the iron. Was there a separate building and forge for doing this and if so, what size were they?

J. What sort of blacksmithing operation was part of the Iron Works? - It is known that there were operating blacksmiths at the Iron Works to use the iron bars produced there. During the Revolutionary War, the 80 cavalry horses of Colonel William Washington were reshod with new horseshoes at the Iron Works in the days just before the Battle of Cowpens. Where was the blacksmith facility located and what size was it? Were there buildings involved?

<u>Phase 2 - Planning, Design and Environmental Permitting</u>

A. Design Criteria for the Replica Iron Works - The design for the new Iron Works will be based on the premise that it will be an actual facility that can produce wrought iron just like the original. However, in practice, the facility will only operate on special occasions. By its very nature, iron making is a very polluting business. Even a small forge, if operated every day, would have a negative impact on the environment of the Glendale community by polluting the air. Also, acquiring the components - ore, charcoal, and limestone- to make iron on a daily basis would be disruptive to the environment and would also be expensive. It is planned that in day to day exhibition, the moving parts of the Iron Works, such as the water wheel and bellows mechanism, would operate and show the visitors somewhat how the Works looked and sounded while operating.

On special occasions, the necessary materials would be accumulated and the forge put into actual operation. This will provide an exciting demonstration and should be of great interest to visitors and students alike.

B. Location - The most important aspect of the planning stage will be to select where the replica Iron Works is to be built. Several factors, including environmental impact, indicate the new facility need not be located on the exact terrain of the original. It appears that for ease of public access, a location in the vicinity of the former textile mill should be considered.

C. Design Specifications - After completion of the investigation phase of the project, the details for the design and construction of the replica Iron Works will be worked out. Using the data found in the Investigation Phase, each component and function of the new Iron Works will be sized and specified and detailed in engineering drawings and purchasing specifications. At least the following components are necessary to operate an Iron Works:

- Ore mining and storage area
- Charcoal processing and storage area
- Limestone mining, crushing and storage area
- Components
  - Waterwheel and connecting mechanism
  - Bellows, operating mechanism and connecting airway
  - Forge with related shelter
  - Hammering area with smaller forge
  - Blacksmithing area with smaller forge

These components for a fully functioning Iron Works replica are shown schematically on page 8. (This schematic is based on the idea that the new facility will be a bloomery forge and not an operating cast iron furnace which is much more complex. If the Investigation Phase shows that the original facility really was a cast iron furnace, this schematic will not apply.)

D. Regulatory Permits - In the operation of the original Iron Works and other iron industry facilities, the owners were not constrained by any regulations by any governmental agency. As a result, there was often severe environmental damage that is visible even today in parts of Upstate South Carolina. Since it will sometimes be in full operation, the new, re-created Iron Works must conform to several different federal and state environmental regulations. Each function of the new facility must be studied and any pertinent permit must be identified and applied for. It is expected that as minimum the following functions must be investigated to see if they will require a permit. There might be others.

- Digging the ore - may need a mining permit.
- Drying the ore - may need an air permit.
- Processing charcoal - will need an air permit.
- Digging Limestone - may need a mining permit.
- Waterwheel - may need a permit to be installed into Lawson's Fork (If this is the method used to turn it.)
- Forge - will need an air permit, may need water permit due to proximity to the creek.
- Hammering area with smaller forge - may need air permit.
- Blacksmithing area with smaller forge - may need air permit.

Phase 3 - Invitation for Bids

The drawings and specifications prepared in Phase 2 shall be submitted out for bids to suitable companies. The returned bids shall be evaluated by the Project Management and special consultants to insure that they are reasonable and meet all of the proposed requirements.

Phase 4 - Construction and Testing

Once the appropriate company has been chosen, the contract for construction of the replica Iron Works shall be let. Provisions must be made so that Project Management and the specialized metallurgy consultants oversee the construction of the facility as it progresses. The completed facility will be inspected and tested by the Project Management assisted by the special consultants.

Phase 5 - Training

Upon satisfactory completion of the replica Iron Works, the special consultants shall train the personnel chosen by Project Management in the operation of the replica Iron Works. This training shall be comprehensive and shall include every step from mining and gathering the raw materials, through firing and operating the forge and ending with actually making the iron bar products. The training shall be thoroughly documented for use by local operators after the consultants are no longer available.

Phase 6 - Operation and Acceptance

The Project Management shall insure that every aspect of the replica Iron Works is suitable for operation. This shall include that all required permits are available and that all safety procedures are being followed. The trained local operators shall fire up the replica under the supervision of the special consultants. A complete cycle of operation shall be performed. This shall include making iron bars from the bloom produced. Successful completion of this trial operation is necessary before final acceptance of the replica Iron Works.

Commercial Possibilities

The blacksmithing area of the facility could be used to produce both useful and decorative iron products to sell to the tourists visiting the operation. This would be right in keeping with the theme and mission of the Iron Works. This could be a good source of continuous income to the completed project. The small amount of iron actually produced by the replica during its periodic operation would command a premium price as “real Glendale iron”. Other products, produced during daily blacksmithing operations, would use commercial steel as the raw material but would still have considerable customer appeal.

Budget Discussion

It is estimated that the following budget items and amounts will be necessary for accomplishment of this proposal.

Line Item	$ Amount
Project Management and Administration	
Phase 1 - Investigation - for Archeological Services and Historical Research	
Phase 2 - Planning, Design and Environmental Permitting	
Phase 3 - Invitation for Bids	
Phase 4 - Construction and Testing	
Phase 5 - Training	
Phase 6 - Operation and Acceptance	
Total	

Sources and References

The following sources and references were used in preparing this proposal:

Publications

Spartanburg - Facts, Reminiscences, Folklore, book by Vernon Foster and is published by The Reprint Company, Publishers, Spartanburg, SC 29304.

A History of Spartanburg County - Compiled by the Spartanburg Unit of the Writers Program of the Workers Projects Administration. Printed in 1940.

The Old Iron District by Bobby Gilmer Moss. Printed in 1972 by Jacobs Press, Clinton, SC

Internet Sites
(Possible Source for Project Consultants)

(http://dept.wofford.edu/Geology/ch11fe.pdf) - *Iron Plantations and the Eighteenth and Nineteenth -CenturyLandscape of the Northwestern South Carolina Piedmont* by Terry A. Ferguson and Thomas A. Cowan; Wofford College Geology Department. This site gives a detailed history of the iron industry in South Carolina.

(http://iron.wlu.edu/) *The Smelter's Art-Experimental Iron Production at The Rockbridge Bloomery* by Lee Sauder and Skip Williams . This site describes many practical aspects of making iron with a forge. Gives detailed steps and "recipes" needed to produce iron in the small quantities that will be done in the Glendale Iron Works replica.

(http://www.leesauder.com/maxpages/Home) - This is another web site on iron by Lee Sauder, see site above. Offers demonstrations and workshops on making iron by the method to be used in the Glendale Iron Works replica.

Schematic of the Iron Works Process