

# AGGREGATE MINING AND WETLAND BANKING<sup>1</sup>

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**Abstract.** Reclamation specialists are interested in developing and designing post-mining land-uses that are locally meaningful. Wetland banking, the creation of new wetlands in compensation for the destruction of other wetlands is one post-mining land-use that is especially pertinent to aggregate mining because the aggregate mining landscape often contains great intrinsic potential to generate new wetlands. The Bend Area mine in Georgetown Township, Ottawa County, Michigan, illustrates this potential for wetland banking. This poster demonstrates through the design process, the application of wetland banking in the development of a master plan for the Ottawa County Parks and Recreation Commission. The case study illustrates creation of wetland banking areas through the act of aggregate mining operations and illustrates the integration of recreation resources with wetland environment.

Additional Key Words: landscape architecture, park design, site planning, aquatic habitats, aquatic environments

## Introduction

This paper presents an overview and an example of the potential integration between the aggregate mining industry and wetland protection for the purpose of providing insight into the evolution of two concepts, wetland banking and mine reclamation. The regulations that govern these two concepts have similar restraints and connections to the issues that occur along urban fringe. Our intent in this paper is to illustrate how the concept of wetland banking and mine reclamation can be combined to provide positive results.

Reclamation specialists are interested in designing and developing post-mining land-use that is valuable to the community as well as the mining companies. Wetland banking is one type of post-mining land-use that is especially relevant to aggregate mining, because the landscape features created through the mining process produces essential elements to generate new wetlands.

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We contend that aggregate mining is an industry that has the potential to create valuable landscape features, for wetland creation, concurrently with extracting and reclaiming a mine site, thus the ability to create cost effective wetland banks. In order to understand how these two processes fit together, it is important to understand a few basic things about the aggregate mining process and wetland banking process.

Wetland banking processes are guided by the Federal Guidance printed in the November 28, 1995 Federal Register. The guidelines for wetland banking established in Federal Guidance were developed under a number of different authorities having an interest in wetlands. One of the most important things to consider when exploring the idea of developing a wetland bank is the need for the service; in other words, a market value must be established. The Federal Guidance encourages the use of wetland credits within the same watershed of the mitigated wetlands. In rare circumstances, when it can be proven that it would be more beneficial in another watershed, the sale of credits may be approved for mitigation in a nearby watershed. This circumstance typically would be required, at a minimum, to be in the same eco-region. The size of the watershed, which varies greatly, will often determine the market value. Therefore in determining the location of a wetland bank, predictions about development within an individual watershed must be made and overlaid with existing wetlands. It's also important to develop wetland banks on several acres of land by parties having a vested interest in their success (Porter, and Salvensen 1996). The economy of scale created by doing this allows for consistent monitoring by experts in the area of wetland creation. It also minimizes the amount of time spent by the Corps of Engineers in monitoring the mitigation process by consolidating wetlands, which are often times smaller and scattered several miles from each other. Scattered wetlands provide less value to a wetland system than a larger continuous wetland that will provide a continuous habitat corridor and a more productive buffer. Just as important, is the provision of adequate hydrological configurations. Those banks that were dependent on the use of artificial hydrology were more likely to experience problems with establishment of long-term success of wetland vegetation, compared to those wetlands that were developed near the watertable.

Several different aspects of mining operations help to warrant the assumption that the development of wetlands during the mining process would be a cost-effective way to develop wetland banks. A Typical mine site is located on the edge of a developing community, often times along a rivers edge or in a low-lying area. These locations may have valuable deposits

below several acres of wetlands. If the deposit is extracted, these wetlands will need to be mitigated. In addition, it is not unusual for mining operations to be as large as 1000 acres or more and it taking as long as 25 years to complete a single site; thus creating a situation where development gradually extends out closer to the operation. The magnitude of land needed for mining allows mining companies a unique opportunity to develop large areas of wetlands that have the potential to be linked to other wetlands within the same watershed. This quality is high on the list of criteria to gain approval for the establishment of wetland banks. The scale of property also provides the chance to use buffers to protect a created wetland from surrounding elements (Environmental Law Institute 1993). The number of years involved in the mining process allows for the establishment of several acres of wetlands at the completion of the mining processes thus time to monitor the bank to assure its success before the potential sale of credits. At the point where these credits are ready to sell, the banked wetlands could be used to mitigate wetlands in the proposed mining operation, or credits could be sold to developers within the same watershed. The fact that mining operations are located near developing areas in need of aggregate, places mining companies in a good position to develop wetlands for wetland banking, allowing mitigated wetlands to remain in the same watershed, thus creating a market value. Using aggregate mining operations as a resource in creating effective wetlands may be one solution to creating economical and effective wetland banks. Another important factor is that aggregate deposits can be found at various depths below ground level, thus creating topography of varied depths above and below the watertable, which is important to encouraging a variety of plant and animal species. Often times, wetlands are created unintentionally during the mining process. Many abandoned mine sites have evolved into unique wetland habitats overtime without any specialized intervention (Brenner 1995). Landscape features created through the mining process produces essential elements to generate new wetlands. Wetland banks located on reclaimed mine sites provide value to the mining company in the following ways:

- Provides mitigation for mined wetlands
- Provides profit through the sale of credits
- Provides increased land value with wetland amenity

With the increased awareness of wetland issues, and the concept of wetland banking, mining operations may see new opportunities to produce profitable reclamation projects that are profitable and enhance the wetland system.

### Study Area

Mining companies in Michigan are receptive to the idea of enhancing post mined land with the creation of wetlands that provide potential mitigation opportunities for future mining operations and additional development in the area. This maximizes the post mine value of the property and generates additional revenue for the mining company. The opportunity to create a wetland bank efficiently and effectively is greater at the pre-reclamation stage. At this stage a site plan can be developed by professionals in mining, site design and wetland creation. Mineral deposit depths guide a large percentage of the site design. The site planner takes this in to consideration when developing the plan and utilizes the typical post mine characteristics and enhances them by strategically placing overburden and mining by products in a way that allows for the development of quality wetlands simultaneously to mining.

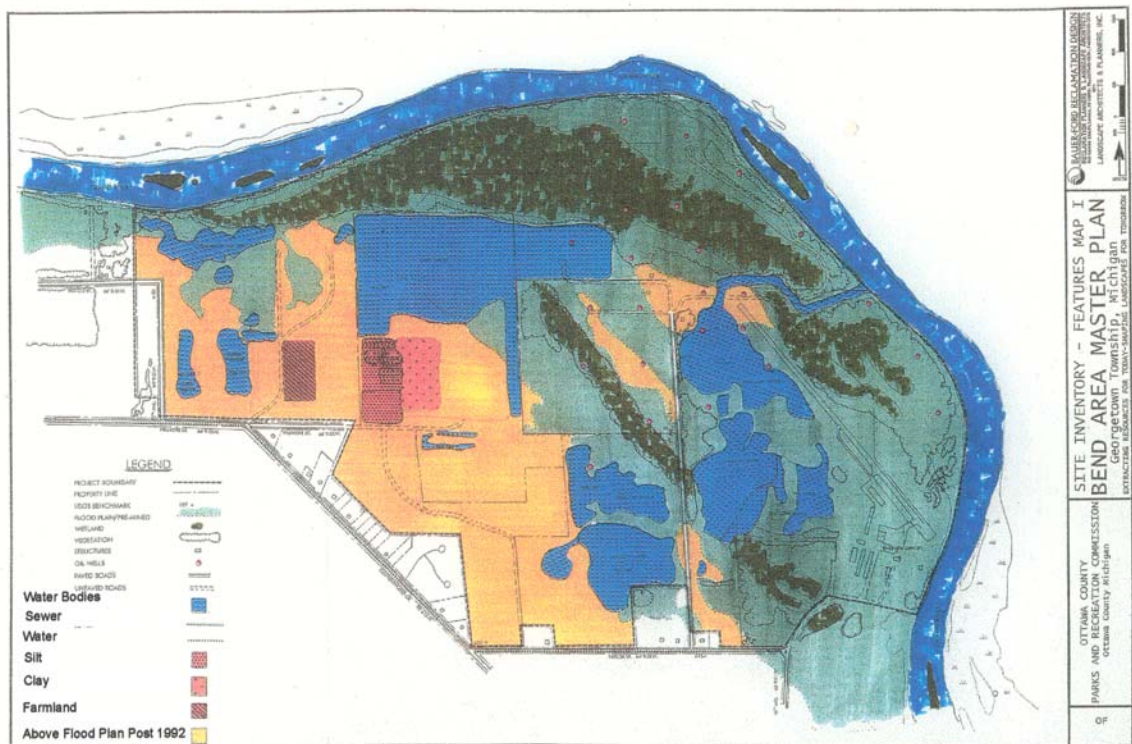


Figure 1. An inventory map of the study area.

Each aggregate mining operation is unique in size, location, surrounding land use and deposit quality and depth. Therefore, not all aggregate mining operations have the potential to be developed into wetland banks. There are specific elements needed to develop a successful wetland bank simultaneous to mining for aggregate. An aggregate mine site in southwest Michigan appeared to have the qualities needed to create a successful wetland bank. This site provided the opportunity to explore the potential fit between aggregate mining and wetland banking.

The study site is located on the southwest side of Michigan in the City of Jenison, Georgetown Township, Ottawa County, Michigan. It consists of multiple mining operations at various stages of mining and reclamation. The Ottawa County Parks and Recreation Commission hired Bauer-Ford Reclamation Design to provide a Master Plan for this approximate 1,000 acre site. The products of that contract were utilized to conduct this study.

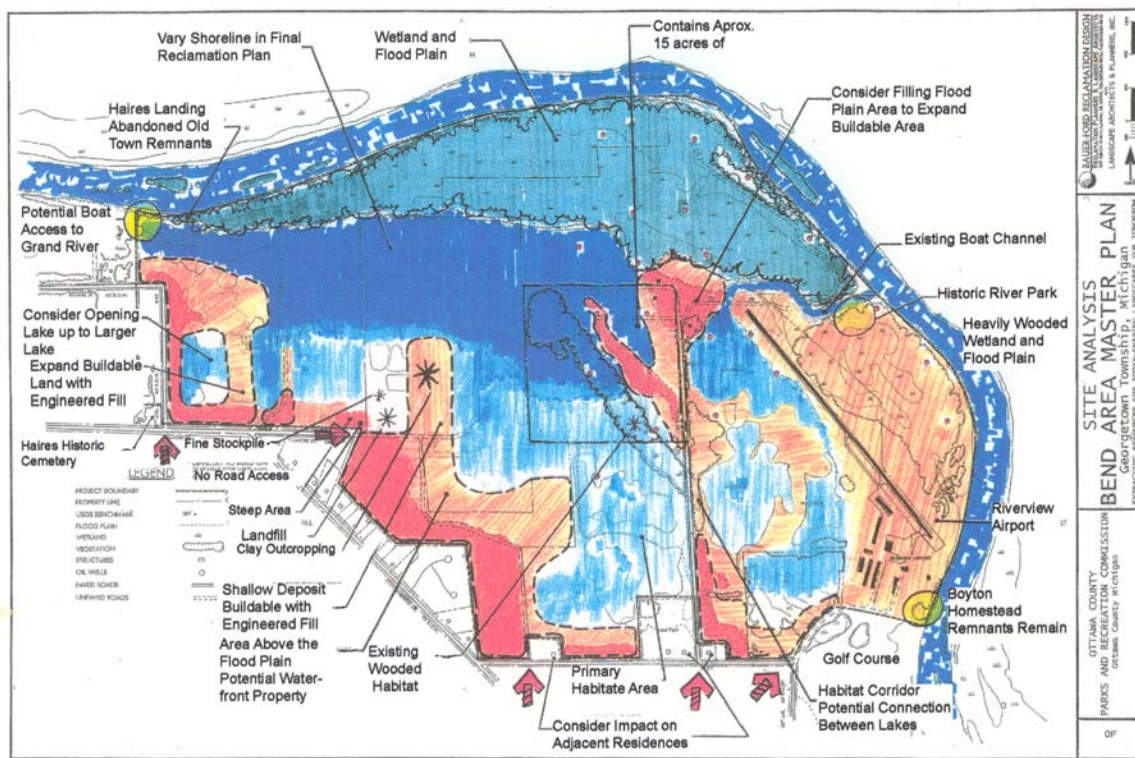


Figure 2. Analysis drawing for site.

The site is owned by six different owners. Four of the owners are mining companies with three of the four companies actively mining the site. The remaining two owners have no mining interest in the properties. The property owners are interested in joining mining and land

development efforts to maximize the value of the site. The project is a unique situation in which the finished product will provide Georgetown Township with Mining Reclamation Plans for the three mining operations and a county Park Master Plan for Ottawa County.

The goal of the project was to provide an analysis of the site to determine the best use of the post-mined land. The project focuses on determining the potential landform configuration at the end of the mining operations, thus providing valuable information when determining the potential for final land use. The Ottawa County Parks and Recreation Commission's interest in the project is the potential for land acquisition to develop as a county park. Post mined land that would not benefit the mining companies for development may be quality land for the development of a county park. In return, the development of a county park has the ability to enhance the potential housing and commercial development providing a win-win situation.

### **Results**

The Master Plan evolved out of an integration of the site's limitations and potentials combined with the interaction of the client, landowners, and Township representatives. Some of the issues that helped in determining the final Master Plan were the quality and depth of the aggregate deposit, the existing protected natural features, the existing soils, existing land use, and the client and land owners preference.

The project began with several meetings with the land owners, Ottawa County Park & Recreation Commission representatives, Georgetown Township representatives, and District representatives for the Michigan Department of Environmental Quality. Then a complete inventory of the site was comprised through the site visits, ground and aerial photography, U.S.G.S. maps, oil well map, wetland map, floodplain map, and historical literature. With the completion of the meetings and inventory, three concepts were developed and introduced to the parties involved. These concepts began the master plan development by providing a visual tool showing the combination of potential land use mixes for the site. This generated input from land owners, the Georgetown Township Board, and Ottawa County Parks and Recreation representatives guiding the final Master Plan for the project referred to as the Bend Area Project.



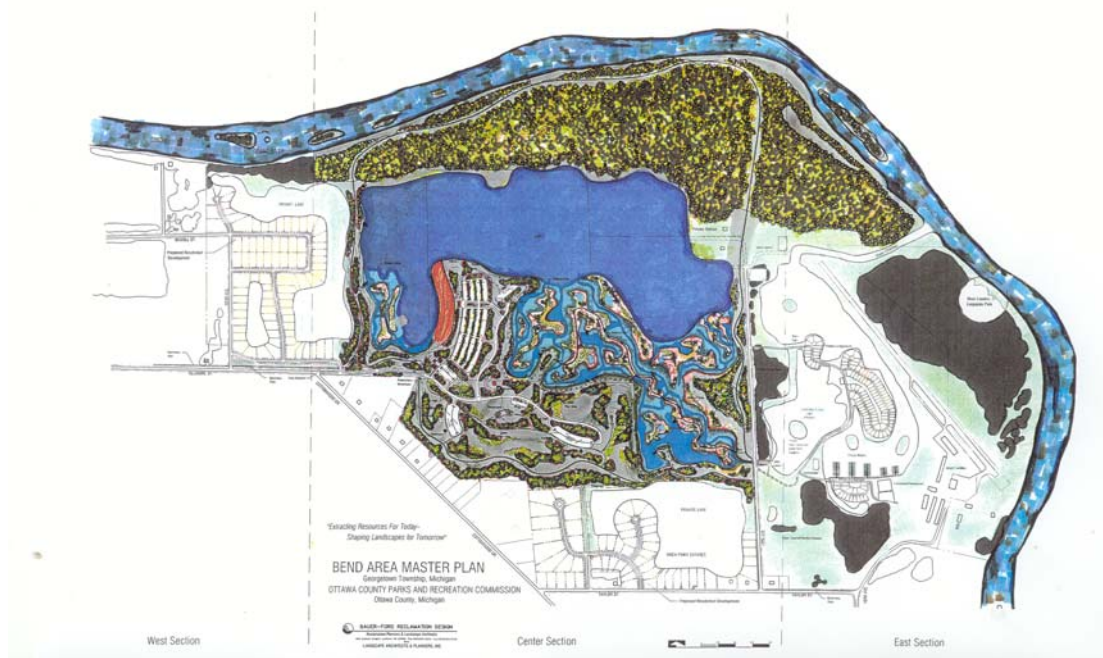


Figure 3. Master Plan for study area.

Because the goal of this project is to provide land owners with optimal value for their post mine properties, the Master Plan provides a combination of proposed housing, commercial, and park development. It is the intention that each will enhance the value of the entire project site.

The existing conditions provided a valuable guide to the development of the final plan. The lakes indicate the location of quality aggregate deposits that range from 20 to 30 feet deep, while the wetland areas indicate where the deposit begins to shallow. A large area of wetlands located between the largest lake and the river will remain in it's existing condition. It is highly sensitive swampy area and would be difficult to mine due to the extent of hydric soils, therefore it provides a high quality buffer and habitat area for a pathway. The existing airport on the eastside of the project guided the decision to develop this area for commercial use. The existing lake on the far northeast side of the project site is channeled to the Grand River allowing public access. Providing a restaurant and marina will enhance the existing and proposed use. The outer edges of the project site are above the 100 -year floodplain elevation of 603 and are 100 feet or more in from the project boundary line because of the 100-foot setback for mining boundaries. This portion of the site did not provide high quality aggregate for mining therefore it is more valuable for development.

The proposed land development for the site is orchestrated to provide smooth transitions and compatible uses between each development. The entire edge of the Grand River is buffered from the developed areas with the preservation of the existing vegetation. This area is entirely in the 100-year floodplain and is predominantly wetlands. A pathway through this area will allow people the opportunity to enjoy a variety of natural areas with minimal disruption to the existing habitat. The only interface with the river from the project site is located at the channel connected to the lake at the far east portion of the project site. This will allow public access from the river to the commercial area of the project. The commercial area at the far east portion of the project proposed the development of trailer and tent camping. There are also two unconnected lakes on this section of the project site, one lake that connects to the river and a second lake that connects to the county park lake. This lake provides a connection to a wetland through a culvert under 12<sup>th</sup> Avenue. This allows the commercial camping area the recreational use of the county park for non-motorized boating. The proposed restaurant is positioned to provide use for boaters, campers, plane commuters, and residents of the area.

The county park area is centrally located on the project site. The proposed and existing mining places the county park from 10 to 20 feet lower in elevation than the surrounding proposed and existing housing developments. It is the intent of this plan to provide access to the county park and at the same time provide visual buffers to allow for privacy. The proposed wetland area is approximately 100 acres. The plan proposes to utilize the mining operations to develop landforms of varied heights above and below the watertable and byproducts of mining to provide for various habitat areas. The wetland area will have a combination of canoe paths and boardwalks with habitat viewing blinds and fishing piers to allow access to designated areas. The plan also proposed the development of a beach, picnic areas, interior paths, and a county path connection on the outer edge of the proposed park. The south and west side of the proposed park is a combination of proposed and existing residential developments. The two proposed housing developments provide private lakes located between the housing and park area maintaining a continuation of the buffer between developed areas and the proposed wetland area. Together the project site provides a balance of commercial, residential, and recreational use blended with a variety of open water, shallow water, and upland habitat areas.



## Discussion

We believe the Bend Area Project provides an opportunity to explore the potential fit between mining reclamation and wetland banking in several ways. First and most important, a potential wetland bank and mining operation have one common bond in which both require a market to justify their existence. If there were no need for development then there would be no need for aggregate mining, and at the same time any need for mitigation of wetlands. The Bend Area Project is located on the outskirts of Grand Rapids, Michigan a popular Metropolitan Area that offers a diverse job market, entertainment, and educational opportunities. Grand Rapids is located in Kent County just east of the Ottawa County line. Population growth trends show communities radiate out from these metropolitan areas and continue to grow outward as maximum growth is reached. According to a Michigan population update conducted by the Michigan Department of Management and Budget, the Michigan Information Center, and the Office of State Demographer, the 1996 county population estimates indicate that 45 counties in Michigan experienced population growth faster than the national average of 0.91 percent between 1990 and 1996. One of the counties within this growth area is Ottawa County with a growth of 13.4% (Michigan Department of Management and Budget 1997). The 1990 population count from the United States Census bureau for the City of Jenison is 17, 882. Jenison is approximately 12 miles outside of the City of Grand Rapids, Michigan a Metropolitan area with a population of 185,437 according to the 1990 census count. The combined population of four counties located within the project site watershed as of the 1990 census count is 895, 179 increasing to 1,005,046 in 1999 census estimates showing an 8.9% increase in population. Population growth in Ottawa County alone indicates the need for aggregate production and potential wetland mitigation. Therefore, the site appears to have a potential population growth and watershed large enough to support the sale of credits from a wetland bank.

Another common bond between wetland banking and mining operations is that both are reliant on location. Mining can only occur where there is an adequate quality mineral deposit and wetlands can only occur where there is an adequate hydrological connection. The nature of aggregate deposits often places them in the same location as wetlands. The nature of mining, excavating below the watertable, has the potential to extend these wetlands by continuing existing hydrological connections.

In addition, the characteristics of the mineral deposit provide an opportunity to extract valuable deposit while creating landforms at various depths above and below the watertable. These minerals have the potential to enhance wetland soils, and provide gravel bases and rock pilings for habitat.

The Bend Area Project has several natural and man-made characteristics that will provide a favorable site to create wetlands. First of all, the site exists along the Grand River, a natural corridor for migrating birds, and it has approximately 160 acres of existing wetlands. A large portion of wetlands run along the rivers edge between the river and the potential wetland bank site. The proposed and existing wetlands are located within the 100-year floodplain with an elevation of 603'. The site also consists of four (4) lakes created through the mining process. The largest open water area of the four lakes is located on the edge of the existing and proposed wetland. This, along with the existing conditions, creates approximately 664 acres of open water, shallow water, and upland area on one site to accommodate a variety of habitats enhancing a potential wetland banks productivity.

These common denominators between the project site features and the features needed to provide a quality wetland bank are enough to generate interest in the concept, but there are additional features to consider. Native wetland plant stock must be available along with the proper soil qualities to encourage the survival of wetland plants. With the project site, there is potential to stock pile wetland soils and seed base from a portion of the existing wetland that is included in the mining operation.

An inventory of plant species and habitat was taken on the site in a mining area that has not yet been reclaimed. The inventory was taken by a nearby resident over a six month time span between April and May of 1998. The inventory shows an impressive wetland plant base germinating on the site along with a diverse collection of bird species. In all, there were fifty-three (53) bird species including the Bald Eagle and the Golden Eagle. Not all of the germinating plants are favorable to a quality wetland and their reproduction will need to be discouraged with the proper herbicide or weeding. This spontaneous generation of plant and animal species is cultivating in an area that has active mining operations to the immediate east and west side. This may be a strong indication of the compatibility of mining and wetland development.

## Conclusion

The Bend Area Project has all of the right elements to give credibility to the idea of creating a quality wetland bank that provides economic value through the reclamation process of aggregate mining. There is the opportunity to create a private/public partnership with the mining operators and the Ottawa County Park Commission in the development and management of a wetland bank that would provide quality recreation and a chance to experiment with wetland development.

The development of wetland banking in an aggregate mine site is not a new concept. There has been an interest in this concept for many years and each state will have different restraints and concerns implementing this concept. But for the most part, the features needed to develop economically and environmentally feasible wetland banks in mine sites are present. The life of the mining operations lasting from 5 to 30 years provides development and monitoring time to establish the bank with minimal effort and cost to the mining company. There is strong evidence that habitat can exist harmoniously with mining operations occurring around a wetland site without disturbance from the operations. Aggregate mining can also provide hydrology, silt, clay, sand, gravel, and rock for the development of wetlands and wetland habitats.

In the process of developing recreational use for the County Park Master Plan, a unique opportunity arises to develop the recreational wetland area into a wetland bank. This will allow for future mitigation of wetlands disturbed in the mining process and provide additional wetland mitigation credits for future development within the Grand watershed. The mining company would have the opportunity to sell the credits for the current market value in the area. A determined percentage of the sales per acre could be set aside to be established in an account for use in monitoring and managing the wetland bank. The land could then be gifted to the Ottawa County Park Commission providing they maintain and manage the wetland to ensure its continued establishment of high quality and quantity of wetland plant and animal species. Thus fulfilling the obligation to maintain the wetland and provide quality recreation for the county park patrons.

There is a developing history of wetland creation to begin to draw experiences from, as well as, a history of wetland banking in several states that will further develop guidelines and techniques for creating wetland banks in aggregate mine sites. The Bend Area Project, or a

project with the same elements, may provide useful insight to the potential of developing quality wetlands in mine sites for the sake of wetland banking.

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