APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): October 15, 2015

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: St. Louis District, Specialty Granules Inc., MVS-2008-826-002-SNR_Stream 1 and MVS-2008-826-002-SNP_Stream 2

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: Missouri County/parish/borough: Iron City: Annapolis
Center coordinates of site (lat/long in degree decimal format): Lat. 37.343594 ° **N**, Long. -90.702354° **W**.
Universal Transverse Mercator: 15
Name of nearest waterbody: Big Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: St. Francis River
Name of watershed or Hydrologic Unit Code (HUC): Middle Big Creek (080202020302)

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): October 29, 2014. A field visit was conducted by Tyson Zobrist and Rob Gramke of the Corps, Audrey Beres, Chris Kennedy, Bruce Henry and Matt Bowyer of Missouri Department of Conservation, Ron Johnson and Mike McCarrin of AECOM and Wade Kemp, Anthony Shepeck, Ronnie Collins and Brandon Kimes of Specialty Granules, Inc. Two tributaries were observed within the site boundaries during the site visit. The main tributary, Stream 1, flows through the center of the site from west to east, where it exits the site to the southeast. The secondary tributary, Stream 2, originates to the north and flows south where it confluences on site with Stream 1. Additionally, a man-made pond was observed onsite.

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain:

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☒ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 7116 linear feet: 2-10 width (ft) and/or acres.
      Wetlands: **N/A**

   c. **Limits (boundaries) of jurisdiction** based on: **Established by OHWM**
      Elevation of established OHWM (if known):

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain:

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. **TNW**
   Identify TNW:

   Summarize rationale supporting determination:

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent":

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**

   (i) General Area Conditions:
   Watershed size: 350 **Square Miles (for HUC 8)**
   Drainage area: 1,790 **Acres (measured from upper headwaters of Stream 1 to its confluence with Big Creek)**
   Average annual rainfall: 44.6 inches
   Average annual snowfall: 10 inches

   (ii) Physical Characteristics:
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☒ Tributary flows through **2** tributaries before entering TNW. (number does not include this tributary)

   Project waters are **60 or more** river miles from TNW.
   Project waters are **0-1** river miles from RPW.

[3] Supporting documentation is presented in Section III.F.
[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

Project waters are **60 or more** aerial (straight) miles from TNW.
Project waters are **1 or less** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. No Explain: Stream 1 and 2 are contained within Iron County, Missouri and do not cross state or country boundaries.

Identify flow route to TNW[5]: Stream 1 flows through the project area, from the west to southeast, where it confluences with Big Creek, approximately 2 river miles from the project site. Big Creek flows into the St. Francis River, a primary tributary to the Mississippi River. The secondary tributary, Stream 2, originates to the north of the project site and flows south where it confluences onsite with Stream 1.

Tributary stream order, if known: Stream 2 is a 1st order stream and Stream 1 is a 2nd order stream. Big Creek is a 6th order stream. (The Strahler Stream Order is used to define stream size based on a hierarchy of tributaries. Tributaries range from 1st at the headwaters to the more powerful like the Mississippi River which is a 10th order. A majority of the tributaries in the United States are first or second order. When two tributaries of the same order combine, a tributary will be classified a higher order.)

(b) General Tributary Characteristics (check all that apply):

Tributary is:
- ☒ Natural
- ☐ Artificial (man-made). Explain:
- ☐ Manipulated (man-altered). Explain:

Tributary properties with respect to top of bank (estimate):
- Average width: 2-10 feet
- Average depth: 2-4 feet
- Average side slopes: 1:1 to 2:1

Primary tributary substrate composition (check all that apply):

☐ Silts	☒ Sands	☐ Concrete
☒ Cobbles	☒ Gravel	☐ Muck
☒ Bedrock	☐ Vegetation.	

☒ Other. Explain: A portion of Stream 1 runs through glade habitat with step-pool features.

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: The onsite streams have been relatively undisturbed. Large riparian buffers are present throughout the entire reach of Stream 1 and 2 within the project area. Minor erosion has occurred in portions of Stream 1 but only under natural conditions. Stream 1 runs through high-quality glade habitat with step-pools.

Presence of run/riffle/pool complexes. Explain: Based on observations made on the October 29, 2014 site visit pools where present within the upper reaches of the intermittent section of Stream 1 as well through the perennial flowing glade area.

Tributary geometry: **Relatively Straight to Meandering**

Tributary gradient (approximate average slope): 0.1% through most of the Stream Reach, The Glade Area is approximately 5%

(c) Flow:

Tributary provides for: **Stream 1: Ephemeral flow to intermittent to Perennial flow (See the following description)**
Stream 2: Ephemeral flow

Estimate average number of flow events in review area/year: **Stream 1: 10 or more, Stream 2: 6 to 10**

Describe flow regime: Stream 1: This stream originates near the southwest corner of the project area as an ephemeral stream feature (Non-RPW) and after 294-feet it transitions into an intermittent stream feature (RPW) mostly due to groundwater influence. The feature is intermittent through much of its length (4,152-feet) before becoming perennial at a point where the slope steepens and the stream drops through a series of bedrock controlled step-pools (Glade Habitat). This intermittent section was primarily dry with some pools during the October 2014 site visit, while water was present, no flow was observed. The substrate consists of sands, gravel and cobble. The banks are vertical and erosional in some locations. According to site personnel much of this feature is often dry with no flow.

The step-pool system (Glade Habitat) appears to be perennial. Flows were observed in October 2014 and again in March 2015. This step-pool system is 1,685-feet in length. At the bottom of the step pool system the stream channel transitions out onto a wider flood plain at which point flow disappears and stream flow becomes intermittent again. It remains

[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

intermittent through the remainder of the Study Area, a distance of 188-feet. This stream continues as an intermittent stream feature as it flows from the Study Area through the Permit/Bonded Area and the remaining portion of the SGI property. Perennial flow resumes outside of the SGI property.

Stream 2: This is an ephemeral feature (Non-RPW) that originates to the north of Stream 1 and flows into Stream 1 near its midpoint. While a bed and bank are present no flow has been observed during the October 2014 site visit or during AECOM's follow-up visit in March 2015. This feature is crossed several times by unimproved roads. Stream 2 is 797 feet in length.

Other information on duration and volume: Other information on duration and volume: A site visit was physically conducted within the project limits on October 29, 2014. During the site visit the Regulatory project manager observed pools in the upper intermittent reach and flowing water and pools were present within the step-pool system of Stream 1.

Surface flow is: **Confined.** Characteristics: Upon observation during the October 29, 2014 site visit, the streams show evidence that flow is contained entirely within the channel banks and the presence of an OHW provides evidence of the confined stream flow.

Subsurface flow: **Unknown**. Explain findings:
- ☐ Dye (or other) test performed: **N/A**

Tributary has (check all that apply):
- ☒ Bed and banks
- ☒ OHWM[6] (check all indicators that apply):
  - ☒ clear, natural line impressed on the bank
  - ☒ changes in the character of soil
  - ☒ shelving
  - ☐ vegetation matted down, bent, or absent
  - ☒ leaf litter disturbed or washed away
  - ☐ sediment deposition
  - ☐ water staining
  - ☐ other (list):
  - ☐ the presence of litter and debris
  - ☐ destruction of terrestrial vegetation
  - ☐ the presence of wrack line
  - ☒ sediment sorting
  - ☒ scour
  - ☐ multiple observed or predicted flow events
  - ☐ abrupt change in plant community
- ☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
- ☐ High Tide Line indicated by:
  - ☐ oil or scum line along shore objects
  - ☐ fine shell or debris deposits (foreshore)
  - ☐ physical markings/characteristics
  - ☐ tidal gauges
  - ☐ other (list):
- ☐ Mean High Water Mark indicated by:
  - ☐ survey to available datum;
  - ☐ physical markings;
  - ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Water was clear as it flowed through the step-pool system and within the intermittent pools, when observed on October 29, 2014.

Identify specific pollutants, if known: The USEPA EnviroMapper website was reviewed for potential pollutants in the project area. No pollutants were identified or known to exist within Stream 1. No information was available for Stream 2.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☒ Riparian corridor. Characteristics (type, average width): According to historical aerial photographs, there has been a forested corridor along the entire length of the 7,116-linear feet of Stream 1 and 2 within the project area. Upon inspection of the aerial maps of the site and the site visit, the forested corridor appeared to be more than 500 feet, however only 100 to 200-feet of this corridor is functioning as beneficial riparian corridor to these two stream systems. Based on the site visit, the forested areas were well established and consisted of mature trees.
- ☐ Wetland fringe. Characteristics:
- ☒ Habitat for:
  - ☒ Federally Listed species. Explain findings: A Level 2 report was received by accessing the MDC Natural Heritage Review website. The Level 2 report indicated that karst habit and the gray bat were known to exist near or within the project area.

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

☐ Fish/spawn areas. Explain findings:
☒ Other environmentally-sensitive species. Explain findings: During the October 29, 2015 site visit personnel from the Missouir Department of Conservation (MDC) were present to look for potential issues or impacts to forest, fish and wildlife resources from the proposed project. According to the comments provided by MDC following the site visit they had the following concerns: "Igneous glade communities are ranked as S3 statewide, or vulnerable to extirpation due to land use changes (or land elimination) and degradation. While glade communities are relatively frequent in the St. Francois Knobs and Basins subsection, high quality igneous glade communities are exceeingly rare due to past land use, mainly overgrazing and cedar encroachement due to a change in fire regime. The glade on SGI property appears to be in good condition, and although small, is of higher quality. Present was moderate encroachment from woody invasive plants such as winged elm and sumac. While little red cedar was noticed. Athough the tour was given during the dormant season, the herbaceous flora appeared rich and robust, suggestiing that the site was not heavily overgrazed. No obvious sign of recent fire were found. This ingneous glade community could possibly be habitat for the federally threatened Mead's milkweed, Asclepias meadii. Also, gray bats, Myotis grisescens, and Indian bats, Myotis sodalis, have been found in Iron County. SGI should consult with the U.S. Fish and Wildlife Service on possible impacts to these federally-listed species. The day of the tour was warm and sunny, and many lizards were observed sunning on the exposed igneous rock; many individuals were observed, including Prairie Lizards, Ground Skinks, and five-lined skinks. It is very likely that many other herpetile species are present on site, including the Eastern Collared Lizard, which is a state ranked species. The Departement recommends that the glade community be surveyed, specifically for Mead's milkweed and Eastern Collared Lizard, no fewer than two times during the growing season. Ideally, these surveys would begin no later than June 1. Department personnel are available for technical advice on designing such surveys, if needed. Due to the rarity of igneous glade commuinties and the quality of the SGI glade, the Department recommends efforts to preserve some of this site's genetic material. The Department would be interested in working with SGI and their representative to remove individuals and/or progeny if the glade will be impacted by the final project."
☒ Aquatic/wildlife diversity. Explain findings: Although fish were not observed within Stream 1, macroinvertebrates were observed in the step-pool system of Stream 1. Headwaters streams, such as the Stream 1 and 2 have been documented as providing necessary habitat for a variety of birds, mammals, reptiles, and amphibian populations.

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size:
Wetland type. Explain:
Wetland quality. Explain:
Project wetlands cross or serve as state boundaries. Explain:

(b) General Flow Relationship with Non-TNW:
Flow is: Explain:

Surface flow is: **Pick List**
Characteristics:

Subsurface flow: **Pick List**. Explain findings:
☐ Dye (or other) test performed:

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
☐ Discrete wetland hydrologic connection. Explain:.
☐ Ecological connection. Explain:
☐ Separated by berm/barrier. Explain:

(d) Proximity (Relationship) to TNW
Project wetlands are river miles from TNW.
Project waters are aerial (straight) miles from TNW.
Flow is from:
Estimate approximate location of wetland as within the floodplain.

(ii) Chemical Characteristics:
Characterize wetland system (e.g., water color is clear, brown, oil film on surface;

Identify specific pollutants, if known:

(iii) Biological Characteristics. Wetland supports (check all that apply):
☐ Riparian buffer. Characteristics (type, average width):

☐ Vegetation type/percent cover. Explain:
☐ Habitat for:
☐ Federally Listed species. Explain findings:
☐ Fish/spawn areas. Explain findings:
☐ Other environmentally-sensitive species. Explain findings:
☐ Aquatic/wildlife diversity. Explain findings:

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately () acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed:

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs. Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: 294-feet of Stream 1 and the entire reach of Stream 2 (797-lineal feet) are non-Relatively Permanent Waters (Non-RPW) that possess features of intermittent tributaries with an ordinary high water mark (OHW). The width of both streams varies from 1 to 5 feet at the OHW and bank heights range from a few inches to 1-foot. Features observed supporting clear evidence of flow and an OHW throughout the each channel include: clear natural line impressed on the bank, shelving and leaf litter disturbed. Based on observed characteristics described above and overall size of the tributary drainage area of Stream 1, 1790-acres and stream 2, 89-acres , the streams display characteristics of first order stream hydrology. We observed that the upper 294-feet of Stream 1 and Stream 2 have the capacity to carry surface flow hydrology via a confined channel to the intermittent and perennial reaches of Stream 1, a primary tributary to Big Creek, from there to the St. Francis River, then eventually to the Mississippi River. There is no interruption in flow or hydrologic connectivity between the onsite tributaries and Big Creek. Based on observed conditions, Big Creek has the capacity to carry surface flow hydrology via a confined channel to the St. Francis River. The St. Francis River flows relatively uninterrupted several hundred miles where it drains into the Mississippi River in the State of Arkansas. Headwater streams, such as Stream 1 and 2, comprise the majority of streams in the United States, both in terms of numbers and length. Ephemeral streams provide several benefits such as sediment control, nutrient control, flood control, wildlife habitat, and a food supply for aquatic species to downstream receiving waters. The following outlines how these two tributaries to Big Creek maintain a significant nexus to the St. Francis River, a TNW, through its hydrologic connectivity.

At the point where hydrology from the unnamed tributaries reach the St. Francis River, the St. Francis River has been designated as a Traditional Navigable Waterway (TNW) within the Memphis District. Since the unnamed tributaries maintains hydrologic

connectivity to the St. Francis River, a significant nexus has been established between the Non-RPW portion of Stream 1 and the entire reach of Stream 2 and a TNW. Hydrologic connectivity refers to the flow that transports organic matter and nutrients, energy, and aquatic organisms throughout the system (Freeman et al., 2006). The unnamed Non-RPW tributaries contribute to the chemical and physical make-up of the intermittent and perennial reaches of Stream 1, Big Creek,the St. Francis River and eventually the Mississippi River, through its ability to convey sediments and attached nutrients during hydrologic pulses generated by precipitation events, as well as through probable groundwater discharge.

The associated streamside riparian corridor that borders the Stream 1 and 2 (as seen in aerials), are important for protecting water quality, stream stability and health, and biological communities. The forested riparian would suggest a continual source of organic input through the transfer of leaf litter and coarse woody debris. In general, as the coarse particulate organic matter and fine particulate organic matter is transferred downstream, invertebrate populations migrate with the material. Additionally, particulate organic matter provides a food source for invertebrates functioning at the decomposer level. Leaves and other detrital material are processed by a feeding group referred to as “shredders”, which can include larvae of craneflies, caddisflies, nymphs of stoneflies, and crayfish. Shredders break down coarse particulate matter, allowing the processed material to be utilized by a secondary group, commonly referred to as “collectors”. Collectors then process the finer materials of organic matter, eventually contributing to the dissovled organic matter content and fine particulate matter content that continually flows downstream (Smith and Smith 2001). The make-up of headwater streams contributes to the biodiversity of the larger receiving waters (Meyer et al. 2007). Given the proximity of Stream 1 and Stream 2 to perennial tributaries, to the St. Francis River and eventually the Mississippi River, its ability to carry organic particulates likely contributes directly to the biodiversity of the Mississippi River.

The riparian corridor would also have trapped nutrient runoff from adjacent uplands. Fertilizers commonly contain phosphorous, which upon application attaches to soil particles. During precipitation events runoff has the ability to detach and transport phosphorous-laden sediments carrying these particles towards the stream. The riparian buffer functions to trap phosphorus-laden sediments, keeping them out of the stream system, which reduces the potential for downstream waters to become eutrophic. Large rainfall events within the area provides a pulse of hydrology to donwstream receiving waterways. After water levels receed, the process of drying produces natural chemical and physical changes in the tributary. It has been identified when headwater streams “dry up”, they continue to be an integral part of the overall stream conditions through their influence on river chemistry (Izbicki 2007).

The wooded riparian corridor that is situated along Stream 1 and 2 contain a deep root structure which functions to reinforce the soil structure along the streambanks and minimize erosion, resulting in the attenuation of sediment input to downstream receiving waters. The riparian corridor also provides shade to sections of the Stream 1 and 2, which sustains surface water temperatures that are conducive for fish to survive and maintain downstream water temperatures. The characteristics of headwater streams can have a direct impact on the physical and chemical properties of receiving waters in other ways unrelated to the direct input of nutrients or pollutants. The temperature of waters conducted through a stream system can have a direct effect on the health of aquatic ecosystems. Runoff collected from exposed surfaces such as roadways and rooftops can be elevated in temperature from solar heating. Exposed stream systems (those lacking a wooded canopy) can also experience elevated water temperatures due to solar heating. Stream systems with wooded canopy shade their water from the sun, allowing water temperatures to cool to ranges considered beneficial to aquatic ecosystems. Since Stream 1 and Stream 2 possess a wooded canopy, it likely contributes to the health and function of the St. Francis and Mississippi River by lowering the temperature of water entering into it.

Stream 1 and Stream 2 contain a sand, gravel and cobble substrate that provides rough and bumpy passages for water which reduces water velocities within the channel. Reduced water velocities minimizes the ability of moving water to erode streambanks and carry sediment downstream. The gravel/cobble substrate also improves upon the channels ability to absorb runoff which recharges groundwater systems such as aquifers, and baseflow contributions to Big Creek but also minimizes the frequency and duration of downstream floods.

Pools of water were observed to be present within the intermittent and perennial reaches of Stream 1. These pools are valuable habitat for aquatic macro-invertebrates and minnows. Pools such as the ones observed in Stream 1 are essential habitat to those species that have greater difficulty feeding or navigating within swifter reaches of the stream or in the larger downstream permanently flowing Big River. Headwater streams, such as the Stream 1 have been documented as providing necessary habitat for a variety of birds, mammals, reptiles, and amphibian populations. Because headwater streams have a small catchment area, they are varied and maintain some of the most diverse habitats within a lotic system. Headwater streams are utilized not only by species unique to headwater streams, but are also used by animals requiring headwater streams for certain life stages and/or are utilized by animals that migrate between headwater environments and larger waters (Meyer et al 2007).

The entire reach of Stream 1 and Stream 2 within the SGI site maintain a hydrologic connection to the St. Francis River through an open and defined channel. Evidence of water flow was indicated through the presence of clear indicators of an OHW and inspection on October 29, 2015. The significant nexus evaluation demonstrates that these two tributaries impact the physical, chemical, and biological integrity of the St. Francis River and Mississippi River. Stream 1 and Stream 2 contribute hydrology to downstream waters, carries and/or filters sediments and other pollutants, and provides organic input to downstream waters. Based on these hydrologic connections, it has been determined that Stream 1 and Stream 2 maintain a significant nexus to the St. Francis River and eventually the Mississippi River.

LITERATURE CITED

Freeman, M.C., C.M. Pringle, and C. R. Jackson. 2007. Hydrologic Connectivity and the Contribution of Stream Headwaters to Ecological Integrity at Regional Scales. Journal of the American Water Resources Association 43:5-14.

Izbicki, J.A. 2007. Physical and Temporal Isolation of Mountain Headwater Streams in the Western Mojave Desert, Southern California. Journal of the American Water Resources Association. 43: 26-40.

Meyer, J.L., D.L. Strayer, J.B. Wallace, S.L. Eggert, G.S. Helfman, and N.E. Leonard. 2007. The Contribution of Headwater Streams to Biodiversity in River Networks. Journal of the American Water Resources Association. 43: 86-103.

Smith, R.L. and T.M. Smith. 2001. Ecology and Field Biology. Benjamin Cummings, New York, pp. 644-650.

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial:
   - ☒ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: Flow has only been observed during wetter parts of the year for most of this stream feature.

   Provide estimates for jurisdictional waters in the review area (check all that apply):
   - ☒ Tributary waters: **6,250** linear feet, 4-5 width (ft).
   - ☐ Other non-wetland waters: acres.
     Identify type(s) of waters:

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
   - ☒ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

   Provide estimates for jurisdictional waters within the review area (check all that apply):
   - ☒ Tributary waters: 1,091 linear feet 1-3 width (ft).
   - ☐ Other non-wetland waters: acres.
     Identify type(s) of waters:

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
   - ☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
   - ☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW:

   - ☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW:

   Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**

[8]See Footnote # 3.

☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain:
☐ Other factors. Explain:

Identify water body and summarize rationale supporting determination:

Provide estimates for jurisdictional waters in the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters:
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain:
☐ Other: (explain, if not covered above):

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource:
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource:
☐ Wetlands: acres.

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[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

- ☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: AECOM, Wetlands and Waters of the US Delineation Report
- ☐ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - ☐ Office concurs with data sheets/delineation report.
  - ☐ Office does not concur with data sheets/delineation report.
- ☐ Data sheets prepared by the Corps:
- ☐ Corps navigable waters' study:
- ☒ U.S. Geological Survey Hydrologic Atlas: Middle Big Creek (080202020302)
  - ☐ USGS NHD data.
  - ☒ USGS 8 and 12 digit HUC maps.
- ☒ U.S. Geological Survey map(s). Cite scale & quad name: MO-Des Arc
- ☒ USDA Natural Resources Conservation Service Soil Survey. Citation: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.
- ☒ National wetlands inventory map(s). Cite name: MO-Des Arch.
- ☐ State/Local wetland inventory map(s
- ☐ FEMA/FIRM maps:
- ☐ 100-year Floodplain Elevation is
- ☒ Photographs: ☐ Aerial (Name & Date): GIS, ORM II, Google Earth Pro and Bing Maps. 1995 and 2013.
  or ☒ Other (Name & Date): Photos from field visit taken by Corps on October 29, 2015 and USGS 7.5-minute topographical map
- ☐ Previous determination(s).
- ☐ Applicable/supporting case law:
- ☒ Applicable/supporting scientific literature: See Literature Cited under Significant Nexus. See also Section IV B below.
- ☒ Other information (please specify): Rainfall data collected from Cook Station in Crawford County, Missouri

B. ADDITIONAL COMMENTS TO SUPPORT JD:

Photographs from the October 29, 2015 Site Visit:

Photographs (2) of Stream 1 (Intermittent Reach) taken upstream of the point where the step-pool system begins. This picture was taken facing downstream.

Photographs (4) of Stream 1 within the step-pool System (Glade Habitat). This reach of Stream 1 was determined to have perennial flow with pools present. This is within the middle reach of Stream 1.

Photographs (3) of Stream 1 within below the step-pool System. This reach of Stream 1 was determined to have intermittent flow with pools present. This is within the lower reach of Stream 1 as it exits the SGI Property.

Aerial depicting Stream 1 and Stream 2: