

# Strategy and Design Considerations for Prioritization of Mine Waste Source Area Remediation within the Headwaters of the Tar Creek Watershed



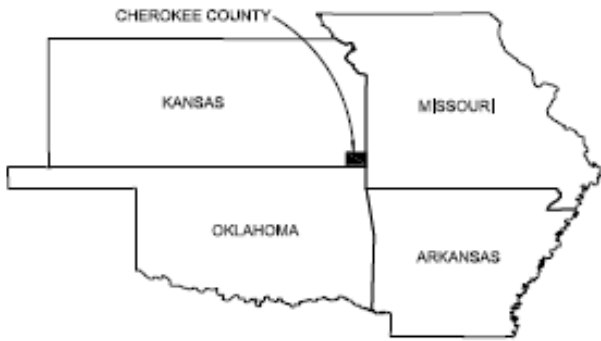
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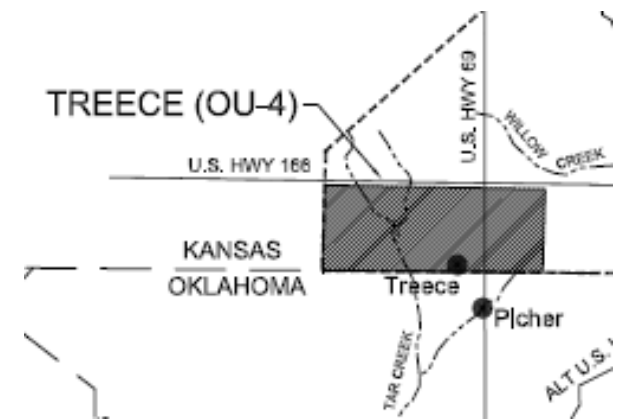
# PRESENTATION AGENDA

- Introduction
- Project Goals
- Summarize existing conditions
- Describe remediation strategy
- Provide preliminary project phasing plan
- Conclusions
- Questions





# INTRODUCTION



- Cherokee County Superfund Site is located in the southeastern portion of Kansas and is part of the Tri-State Mining District
- Operable Unit (OU) 4 – Treece Subsite is a U.S. Environmental Protection Agency (EPA) Superfund site
- OU-4 is located in and around Treece, Kansas and encompasses approximately 11 square miles or about 7,040 acres
- OU-4 includes Tar Creek and adjacent mine waste areas between State Line Road and Highway 166
- Surface water runoff impacts to Tar Creek from adjacent mine waste areas

# PROJECT GOALS



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- Eliminate ecological and human health risk pathways resulting from exposure to mine waste
  - Consolidate and cover mine waste
- Reduce cadmium, lead and zinc loading on Tar Creek
  - Mine waste removal and consolidation to eliminate water and sediment contamination from existing surficial mine waste
- Stabilize and restore Tar Creek

# SUMMARY OF EXISTING CONDITIONS

# MINE WASTE AREAS

- Approximately 5,300,000 cubic yards of mining wastes were identified in OU-4
- Approximately 1,900,000 cubic yards of mining wastes remediated to date in OU-4
- Tar Creek and adjacent mine waste areas remain to be remediated



# ENCROACHMENT OF WASTE PILES

- Waste piles at the downstream portion of the main channel infringe on the stream
- Sediment contamination from surficial mine waste
- Resuspension of sediments and metals is a mechanism of mine waste transport
- High stream velocities caused by waste piles on both sides of stream bank
- Potential for future stream degradation



Example of Mine Waste Encroachment



# EXISTING STREAM CROSSINGS

- Many of the existing stream crossings at county roads in the project area are in poor condition
  - Downstream of project area is a low-water crossing (State Line Road)
  - Culverts for main channel of Tar Creek are reinforced concrete pipes and the bridge is cast-in-place concrete
  - Culverts for Northwest Tributary are cast-in-place concrete bridges and have an open bottom



State Line Road Low-Water Crossing

# EXAMPLE OF EXISTING STREAM CROSSINGS



Tar Creek - SW Star Road Culverts  
Southwest of Muncie Pit



Northwest Tributary - SW Star Road Culvert  
Southeast of TC-2



# STREAM DEGRADATION ON NORTHWEST TRIBUTARY

- Examples of stream degradation include:
  - Headcutting, where the stream lowers grade
  - Bank erosion, caused by high velocities downstream of stream crossing as well as headcutting
  - Impaired water quality and wildlife habitat



Example of Bank Erosion



Example of Headcutting

# EXISTING POOLS OF WATER

- Existing pools of water
  - Abandoned structures from old mining-related haul roads and railroad crossings impound water on Tar Creek
  - Previous USACE project at Muncie Pit
  - Animal activity, such as beaver dams also impound water



Example of Existing Structure Impounding Water



Example of Existing Structure Impounding Water



# REMEDIATION STRATEGY

# GENERAL REMEDIATION STRATEGY

- Excavate mine waste, contaminated soil, and contaminated sediment and transport to and dispose at mine waste consolidation areas
- Fill subsidence features
- Abandon vent pipes and open mine shafts
- Cover mine waste consolidation areas with 12 inches of select fill and 6 inches topsoil
- Backfill excavated areas as needed for positive surface drainage

# GENERAL REMEDIATION STRATEGY (cont.)

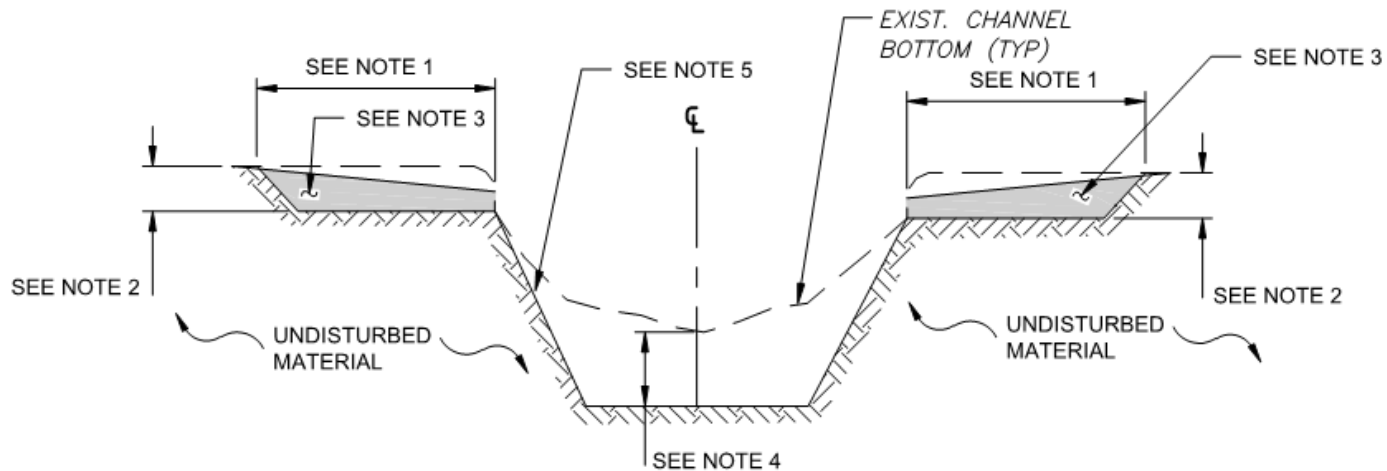
- Reduce the quantity of impacted watershed runoff to improve Tar Creek water quality
  - Consolidate and cover the mining wastes then revegetate the areas
  - Realign Tar Creek to provide separation from the mine waste consolidation areas
- Construct grade control structures to maintain stream elevations and alignments
- Seed disturbed areas
- Restore wetlands





# STREAM RESTORATION STRATEGIES

- Excavate mine waste and contaminated sediment and soil
  - Excavate visible mine waste adjacent to and within Tar Creek
  - Excavate 12-inches of contaminated sediment from Tar Creek
  - Backfill Tar Creek excavation to within 6 inches of original grade as needed



TYPICAL CREEK CHANNEL EXCAVATION/RESTORATION



# STREAM RESTORATION STRATEGIES (cont.)

- Restore creek hydraulics to a pre-remediation condition and address existing stream degradation
  - Construct Newbury riffles to hold stream in place
  - Install riprap aprons at downstream crossings to resist high velocities
  - Grade and vegetate banks to stabilize slope



Example of Newbury Riffle

# STREAM RESTORATION STRATEGIES (cont.)

- Replace artificial obstructions within creek to enhance ponded areas
  - Remove abandoned structures from old mining-related haul roads and railroad crossings that impound water
- Protect creek alignment upstream of existing road crossings
  - Construct in-stream structures upstream of road crossings to protect stream alignment in the event of future road improvements by county/state road departments



# WETLAND RESTORATION

- Goal of exceeding a minimum 1:1 ratio of wetlands for pre- and post-construction conditions
- Use wetland seed mix for restoration in majority of areas along creek
- Use wetland plugs in selected areas
- Provide additional maintenance of restored wetland areas to assist establishment



# SHORT- AND LONG-TERM MONITORING OF REMEDY

- Conduct aquatic macro invertebrate study
- Conduct background and baseline sediment and water sampling
  - Sample pre- and post-construction for each phase
  - Sample upstream and downstream of remediated areas
- Long-term monitoring will provide indication of success of the remediation



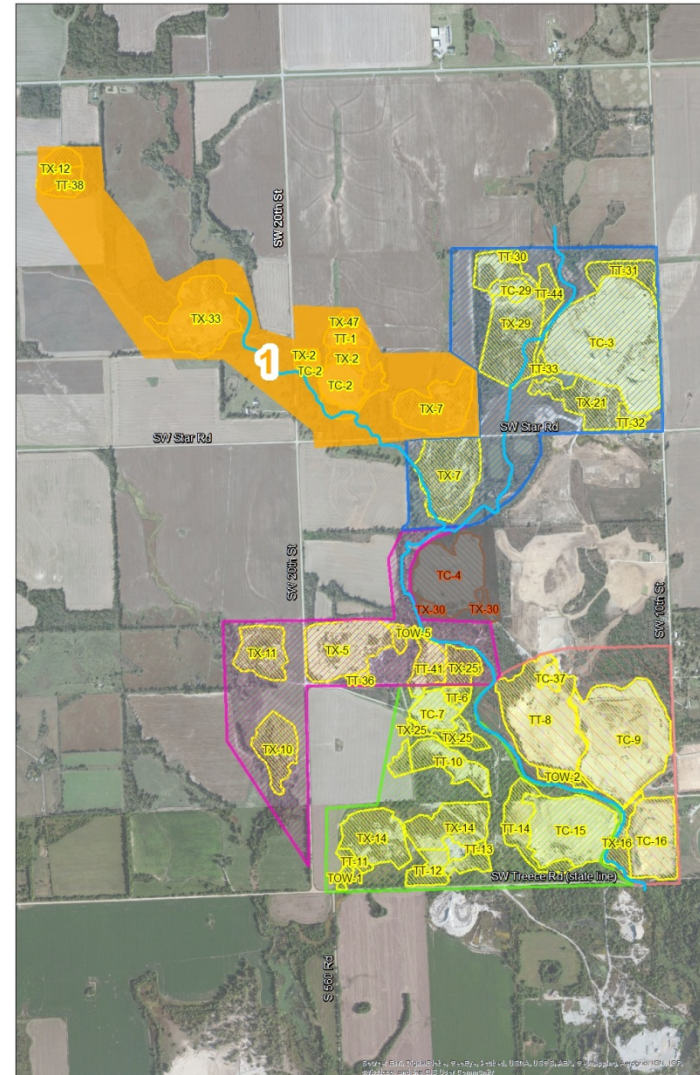
# PRELIMINARY PROJECT PHASING PLAN





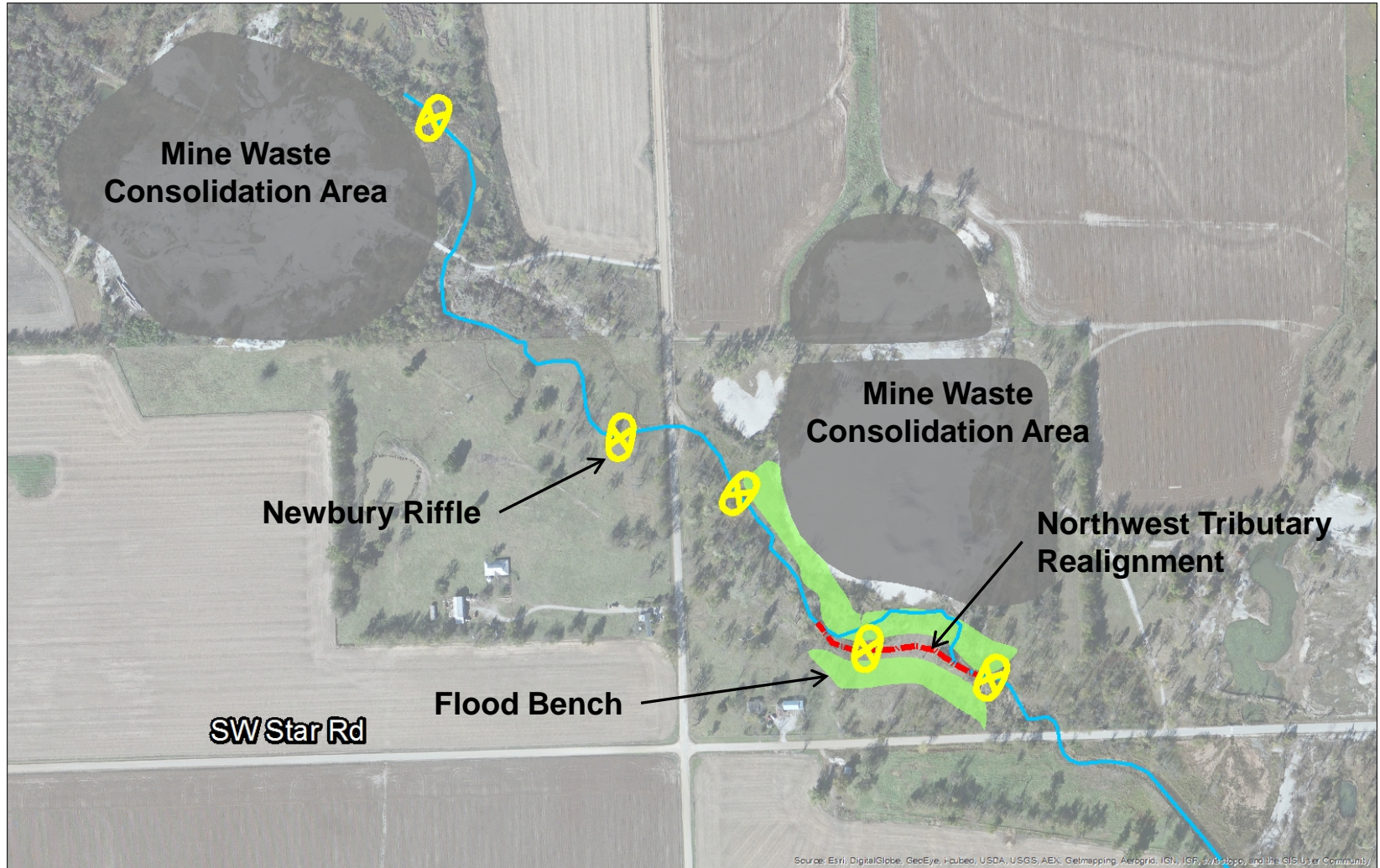
# PHASE 1

- Design for Phase 1 is currently underway
- Remediate Northwest Tributary of Tar Creek north of Star Road
- Excavate mine waste, contaminated soil, and contaminated sediment
- Consolidate material on the east and west sides of SW 20<sup>th</sup> Street, and construct cover
- Realign tributary to avoid existing structures
- Restore and revegetate existing pastures and wetlands



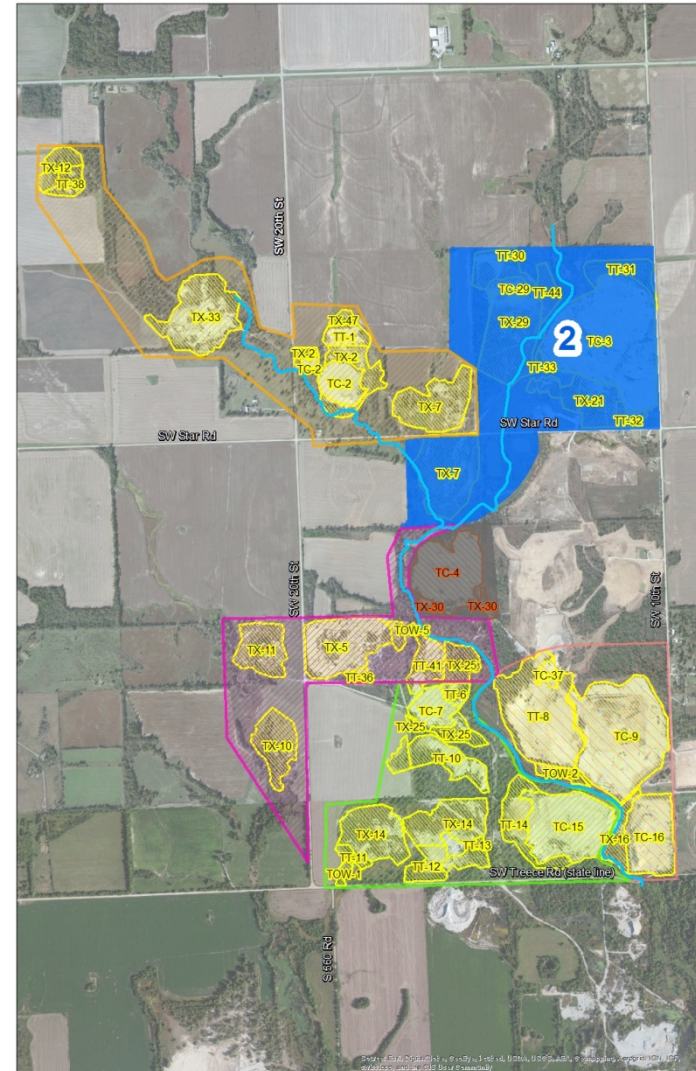


# PHASE 1 (cont.)



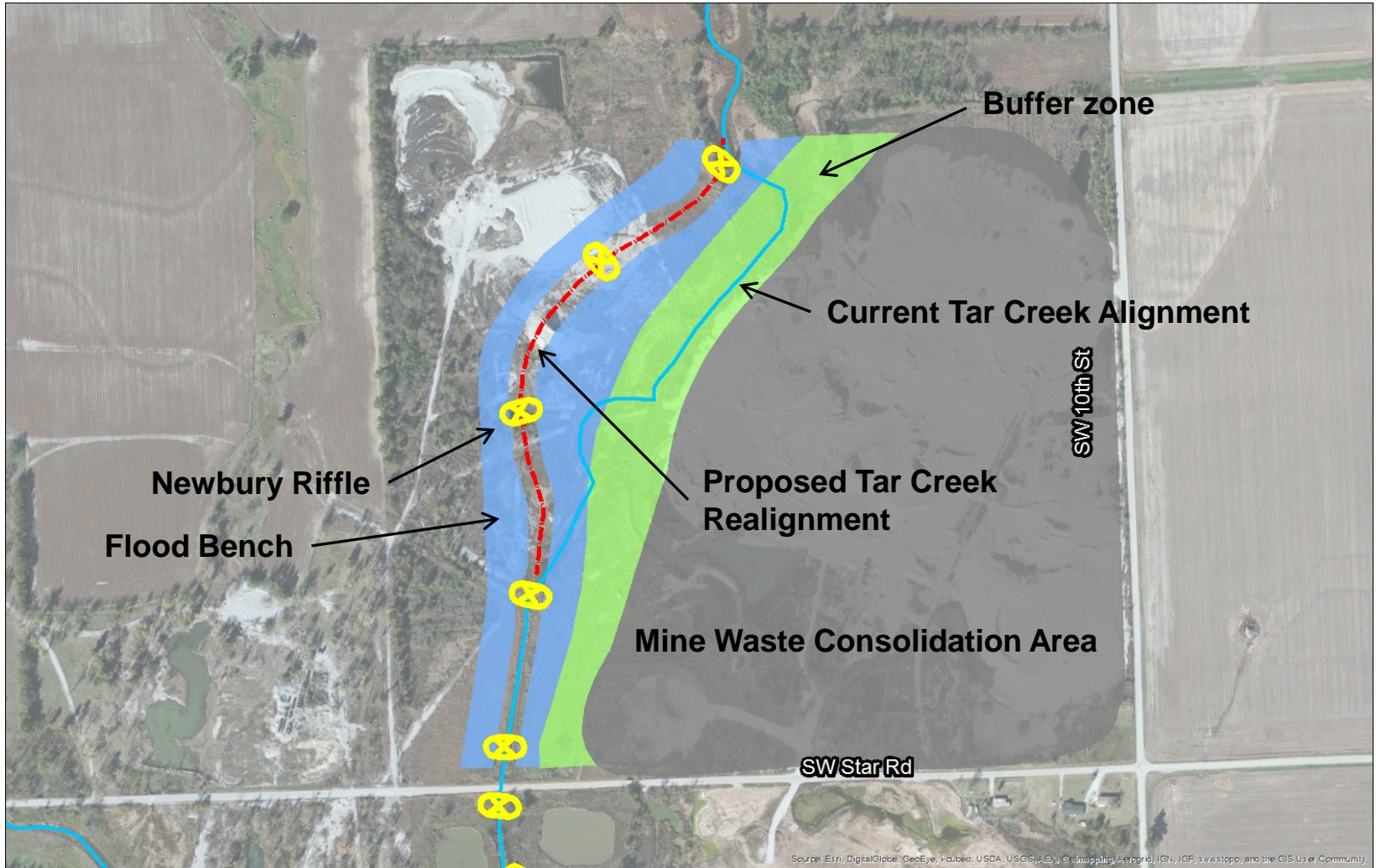
# PROPOSED PHASE 2

- Remediate Tar Creek north of Star Road, northwest tributary south of Star Road (TX-7 South), and adjacent mine waste areas
- Excavate mine waste, contaminated soil, and contaminated sediment
- Consolidate material on existing TC-3 mine waste area
- Place cover on mine waste consolidation area
- Realign Tar Creek to the west in existing mine waste area to provide separation from mine waste consolidation area





# PROPOSED PHASE 2 (cont.)





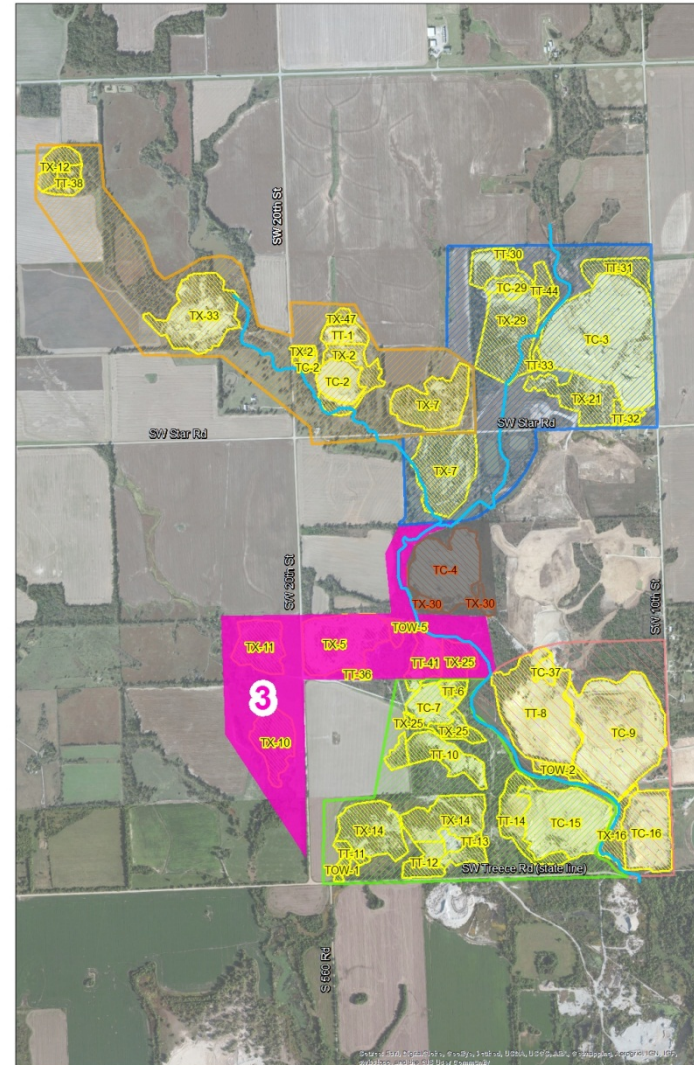
# PROPOSED PHASE 2 (cont.)





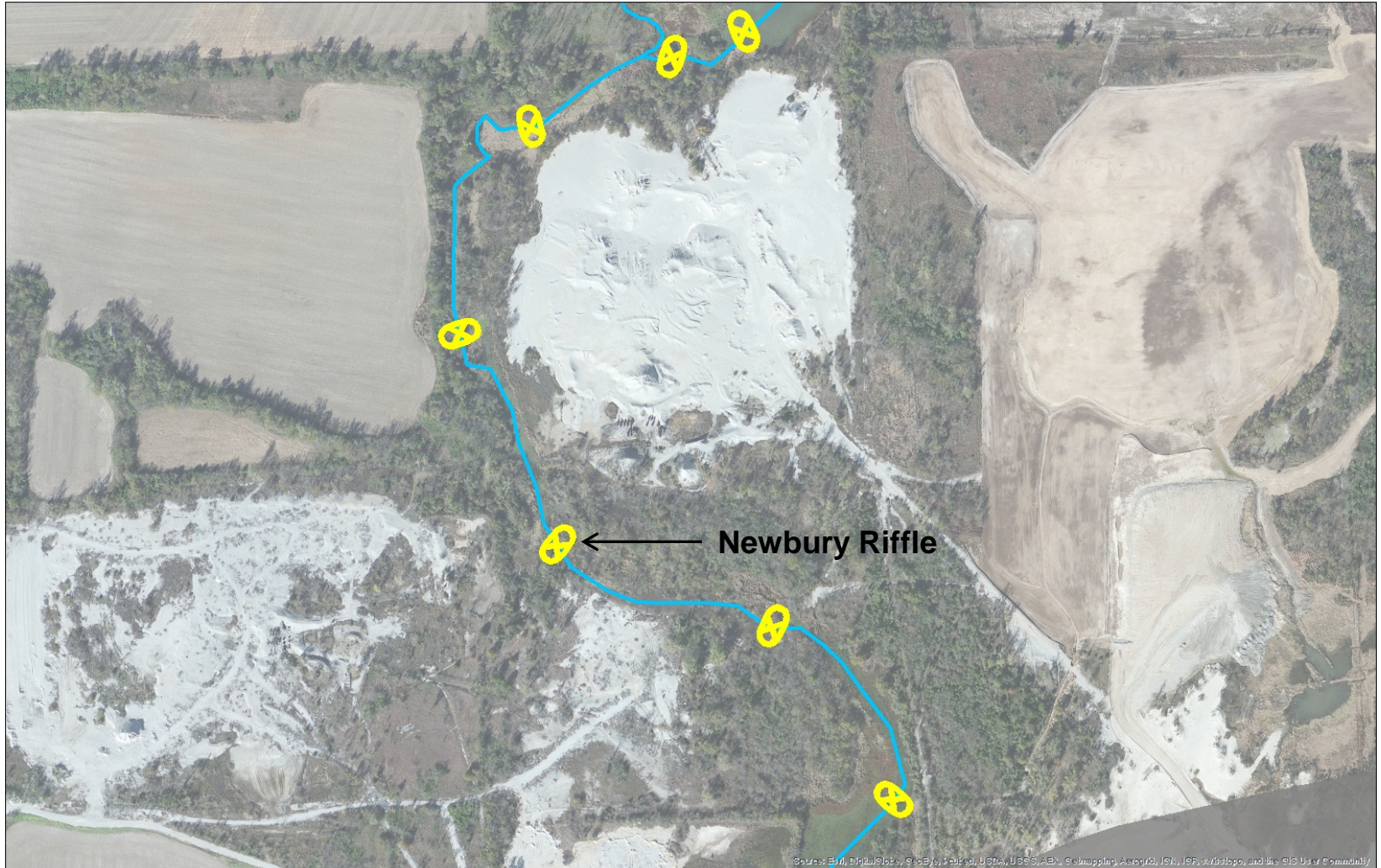
# PROPOSED PHASE 3

- Remedial action design and implementation at TC-4 will be conducted by a potentially responsible party (PRP) which will be incorporated into the overall design for Tar Creek
- Remediate Tar Creek south along the PRP area to the future western tributary outlet
- Excavate mine waste, contaminated soil, and contaminated sediment and place at southwest mine waste consolidation area in Phase 4.





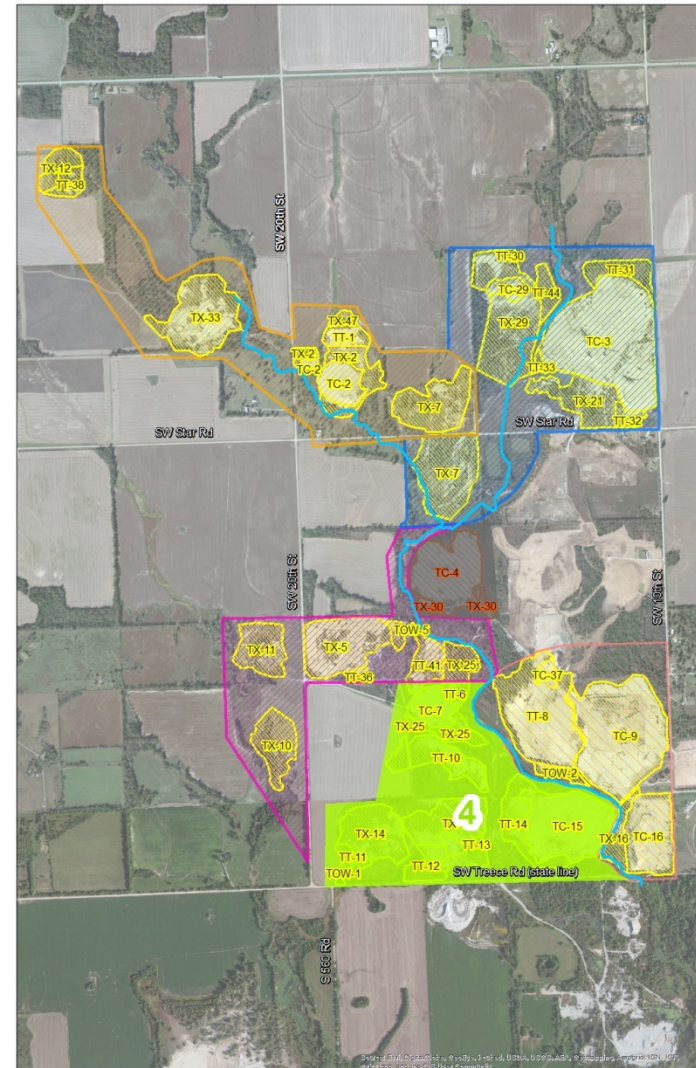
# PROPOSED PHASE 3 (cont.)



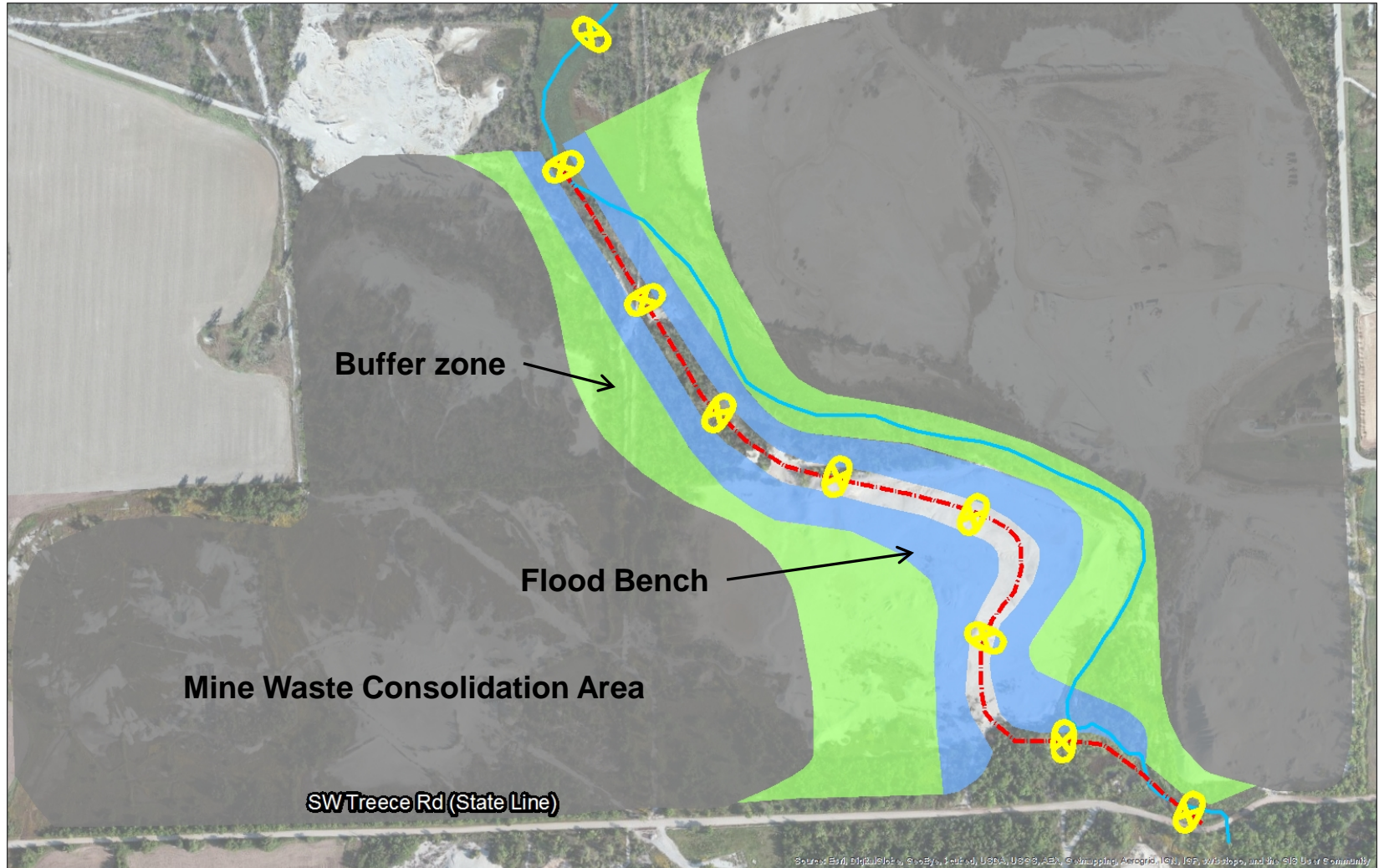


# PROPOSED PHASE 4

- Pull back mine waste and contaminated soil from areas TC-15/TT-14 for later realignment of Tar Creek
- Excavate mine waste, contaminated soil, and contaminated sediment and place in southwest mine waste consolidation area
- Place cover on southwest mine waste consolidation area



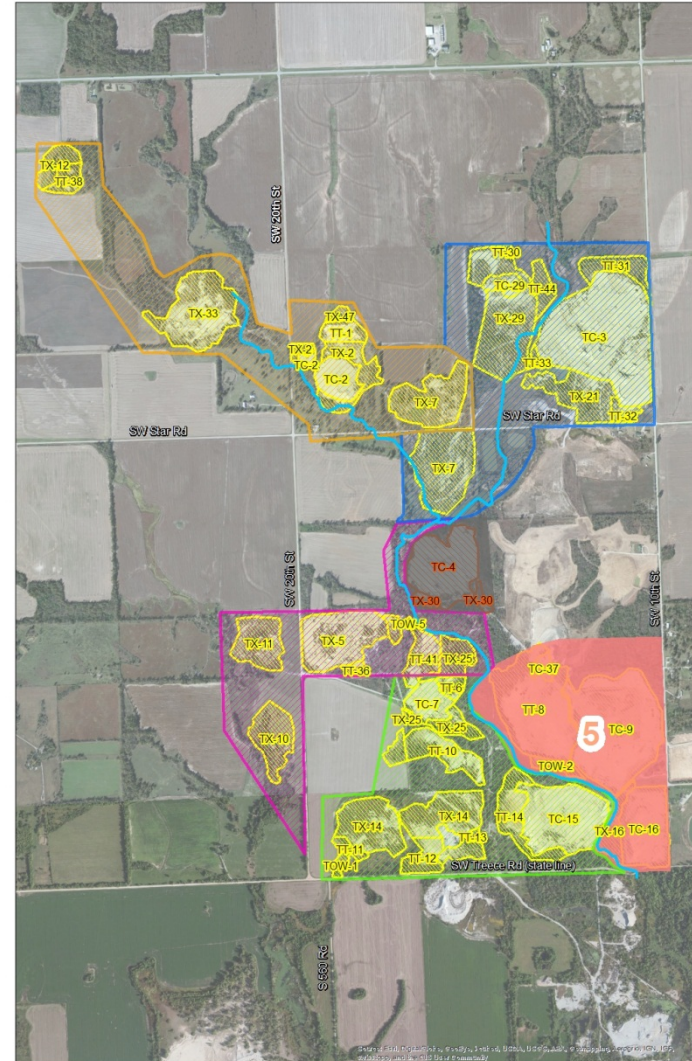
# PROPOSED PHASE 4 (cont.)



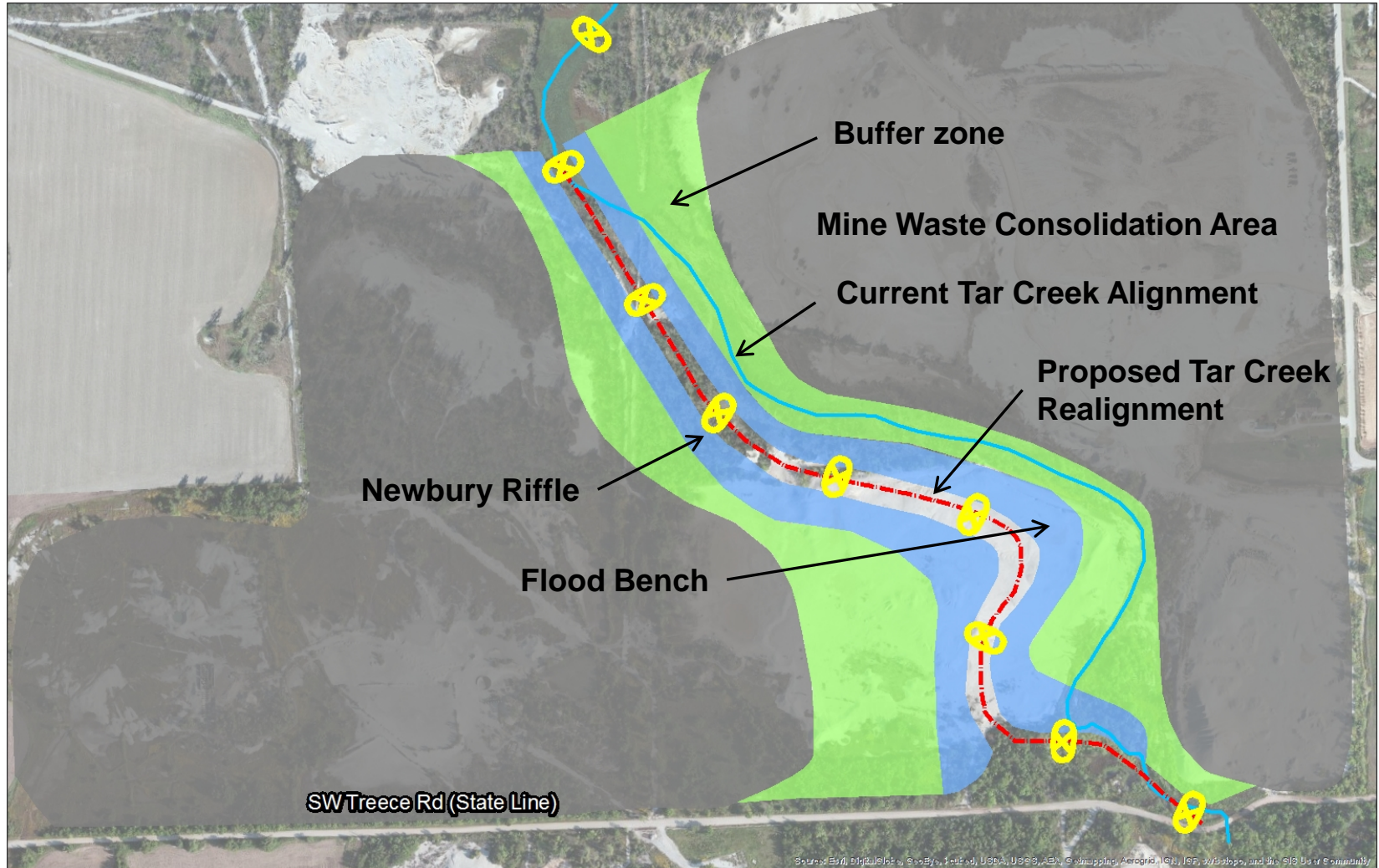


# PROPOSED PHASE 5

- Remediate Tar Creek from the former railroad spur to State Line Road in areas not subject to realignment
- Realign Tar Creek to provide separation from TC-9/TT-8/TOW-2 mine waste consolidation area and address previous concerns regarding leaching from subsurface contaminants
- Excavate mine waste, contaminated soil, and contaminated sediment and place at mine waste consolidation area
- Redirect drainage north of mine waste consolidation area to west Tar Creek



# PROPOSED PHASE 5 (cont.)





# CONCLUSIONS

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- Remove and consolidate remaining mine waste, contaminated soil, and contaminated sediment adjacent to and within Tar Creek and OU-4
- Remediate Tar Creek from upstream to downstream in five phases as funding becomes available
- Restore and stabilize Tar Creek and adjacent areas including wetlands
- Conduct pre- and post-construction water quality and macro-invertebrate sampling in Tar Creek



QUESTIONS?