Black Creek Consolidated Drain

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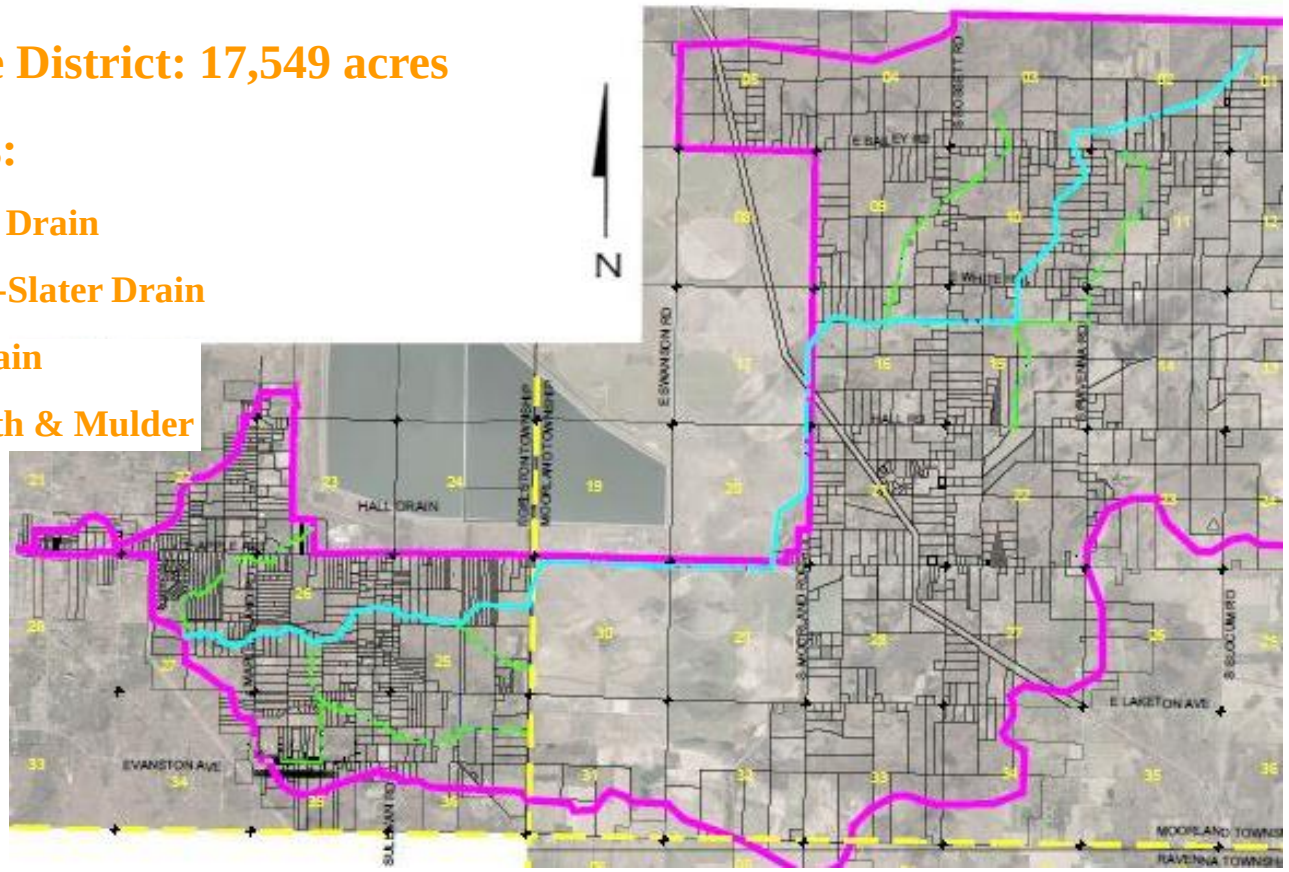
SUMMARY OF DRAIN SYSTEM:

- **Drain Length: 52 Miles**
- **Total area of Drainage District: 17,549 acres**
- **Eng., Inc. Focus Areas:**
  - Former Muskegon Newaygo Drain
  - Former JTB&S and JTB&S-Slater Drain
  - Former Smith & Mulder Drain
  - Proposed Branch of the Smith & Mulder
  - Former Daley Drain
  - Former Little Drain
  - Former Big & Outlet Drain
  - Former HH&G Drain
  - Former Bell Drain

Eng., Inc. ~ 27 miles (shown in blue and green)



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WORK PERFORMED TO DATE:

- Conducted topographic survey of ~27 miles of open drain
- Evaluated and inspected condition of entire length of drain
- Prepared Conditions Summary Reports for each branch of drain
- Prepared preliminary design plans for recommended scope of project
- Prepared final construction drawings and specifications for bidding
- Bid Packages for 7 of 12 Divisions

- Coordination with MDOT for culvert replacement
- Easement acquisition for 2 properties

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PROPOSED DESIGN BEST MANAGEMENT PRACTICES OVERVIEW:

Primary Techniques to be Utilized

- Woody Debris Management
- Open Drain Cleanout
- Two-Stage Channel
- Stream Meander
- Bank Stabilization
- Riffle Zones & Vanes
- Culvert Improvements

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PROPOSED DESIGN

Open Drain Restoration – Woody Debris Management

Existing: Muskegon-Newaygo Drain west of Ensley Road

Proposed Condition: Unobstructed streamflow in the main channel.

Design Objective: Remove log jams and woody debris from the main channel in a non-intrusive manner done without the use of heavy equipment or damage to environmentally sensitive areas.

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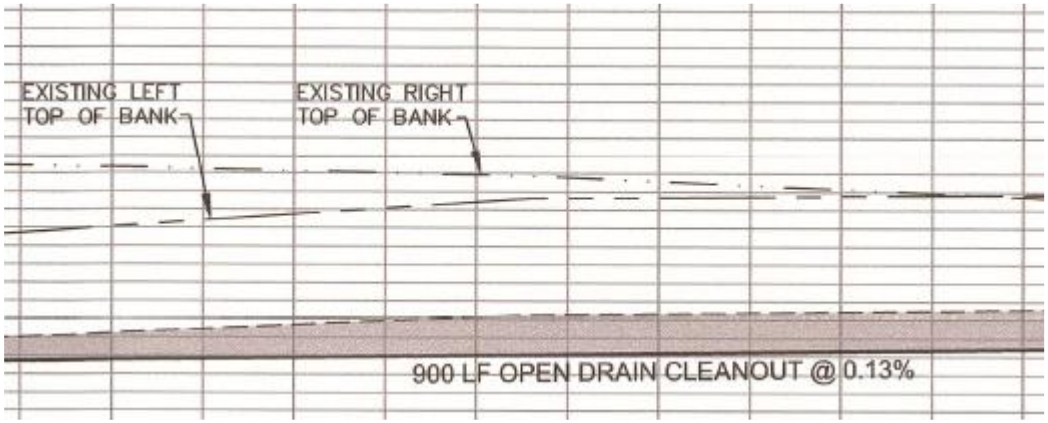
PROPOSED DESIGN

Open Drain Restoration - Cleanout



Design Objective: The most basic drain maintenance technique utilized to improve flow conditions in an open drain system, by removing sediment deposition and vegetation in the channel to allow for efficient streamflow.

Existing: Smith & Mulder Drain - west of Barnes Road

Proposed Condition

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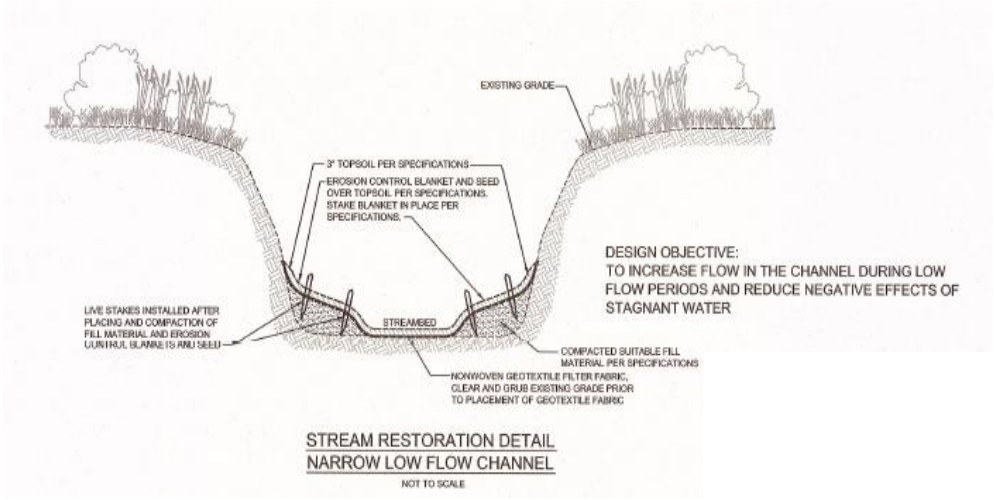
PROPOSED DESIGN

Open Drain Restoration - Two-Stage Channel



Design Objective: Used to increase velocities in the channel during low flow periods and reduce the negative effects of stagnant water while providing reduced velocities during high flow periods, utilizing the flow area in the upper bench.

Existing Condition: Overly-widened Muskegon-Newaygo Drain near Swanson Road

Proposed Condition

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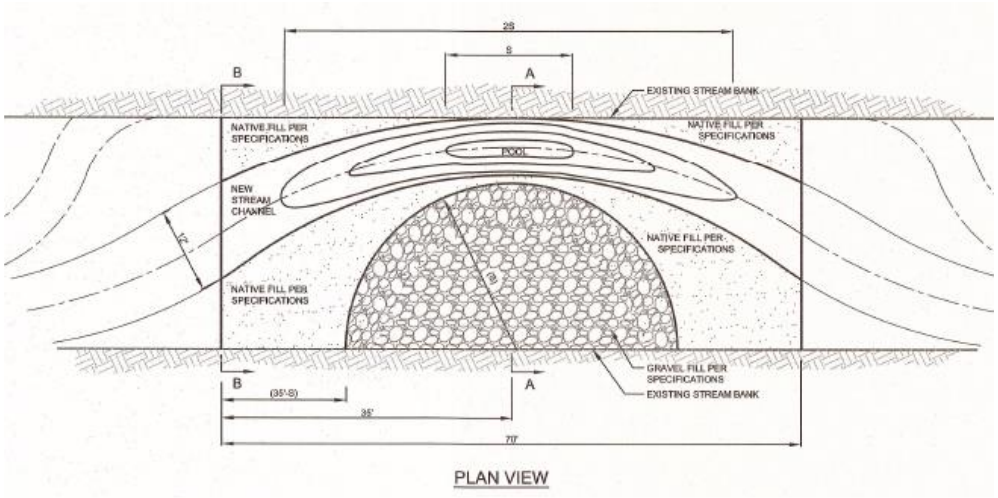
PROPOSED DESIGN

Open Drain Restoration - Stream Meander



PLAN VIEW

Design Objective: To re-create a channel to mimic natural conditions which provide areas for natural sediment deposition and reduce the channel cross section during low flow events, to increase velocity and improve water quality.


Existing: JTB&S Drain – Over-widened


Proposed Condition

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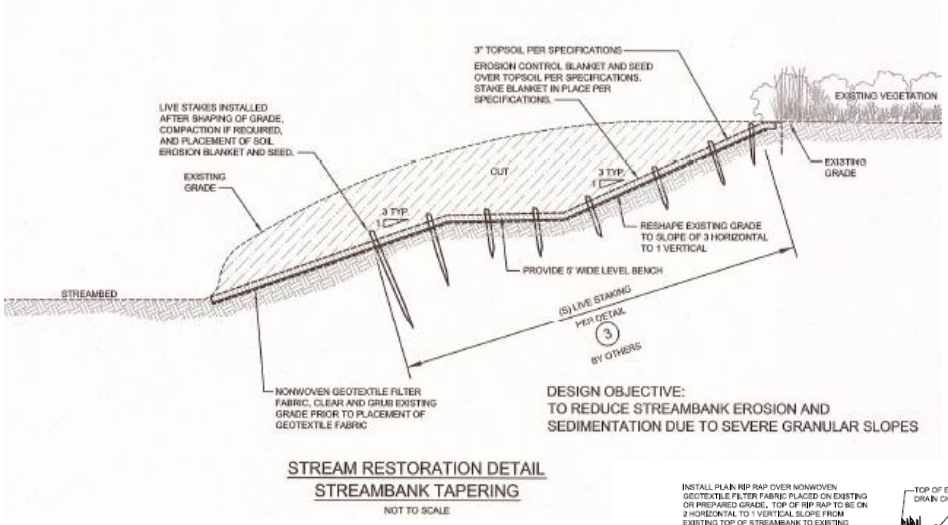
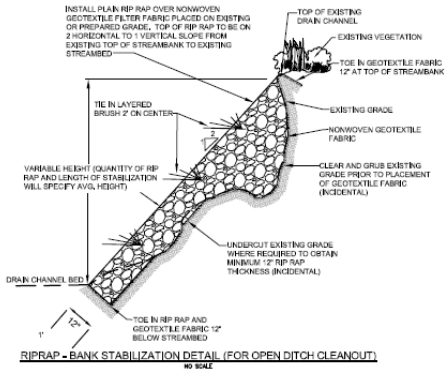
PROPOSED DESIGN

Open Drain Restoration - Bank Stabilization



Design Objective: To reduce and/or alleviate streambank erosion and sedimentation due to severe granular soil slopes



Existing Condition: JTB&S east of Bossett

Proposed Condition

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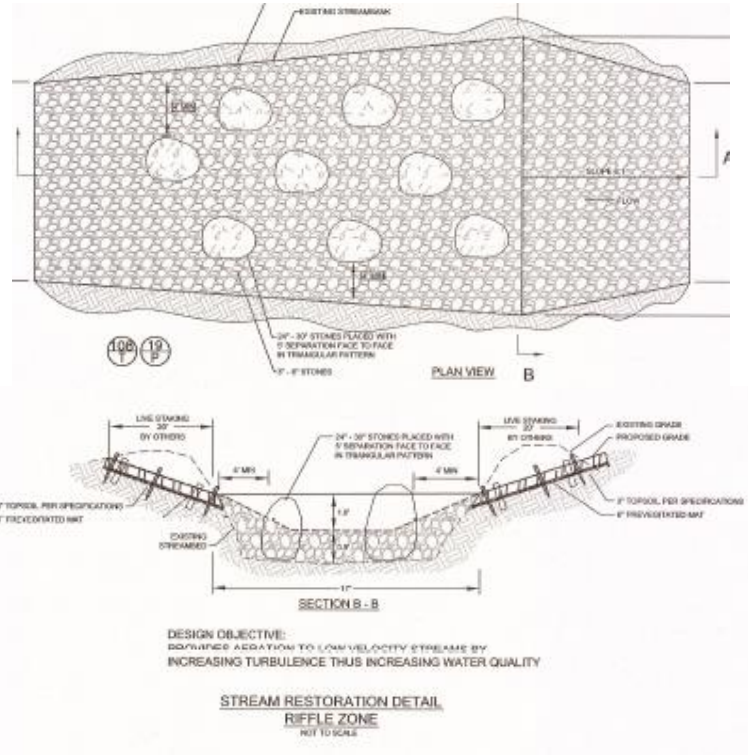
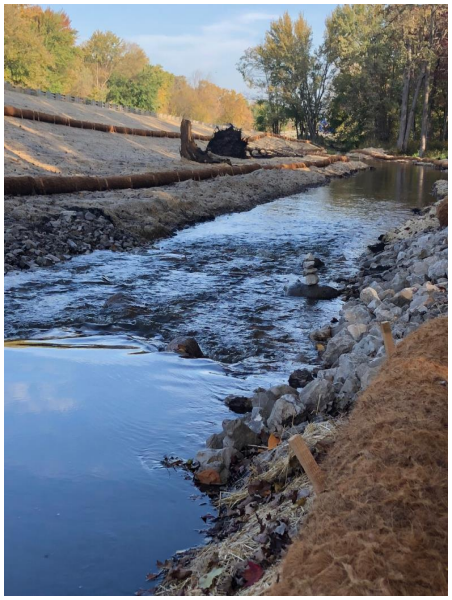
PROPOSED DESIGN

Open Drain Restoration - Riffle Zones & Vanes



Design Objective: Provides aeration to low velocity streams by increasing turbulence, thus improving water quality



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PROPOSED DESIGN

Open Drain System -Culvert Improvements

Existing Condition
JTB&S Slater Drain failing CMP culverts

Existing Condition
Barnes Road wooden culvert crossing

Proposed Condition – Single CSP Arch

Proposed Condition – Precast Box Culvert

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MUSKEGON-NEWAYGO AND BIG & OUTLET DRAIN RECOMMENDATIONS:

- Meandering two-stage channel at over-widened sections
- Woody vegetation and deadfall removal in downstream braided (natural) channel sections
- Culvert replacement at Swanson & M-46
- In-stream BMPs throughout
- Bank stabilization

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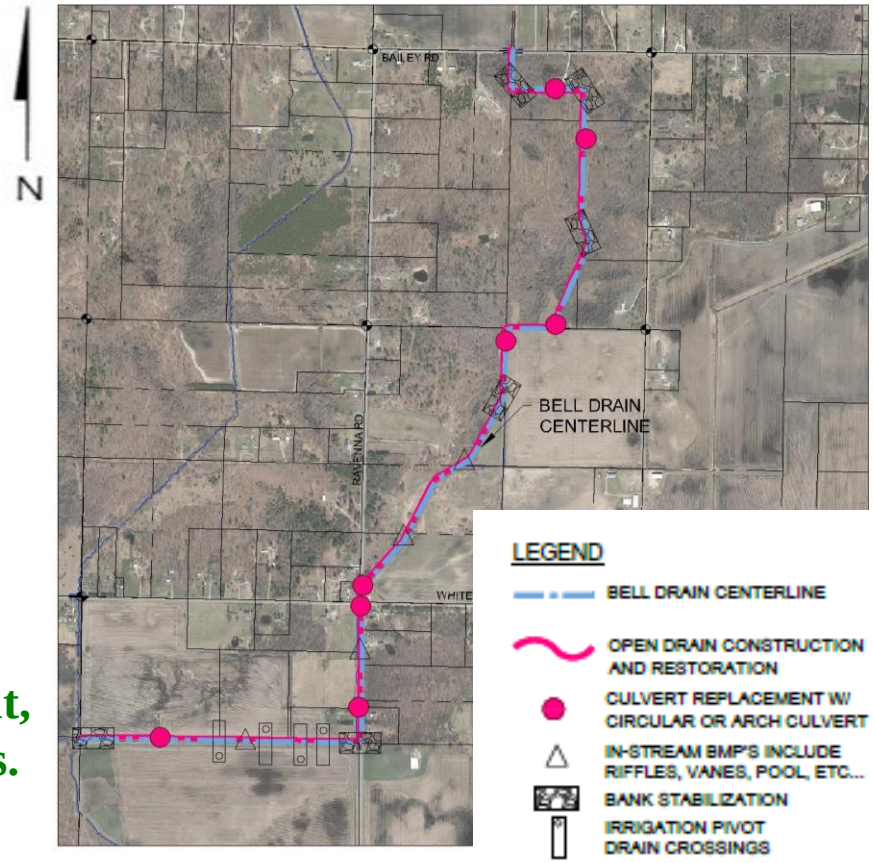
BELL DRAIN RECOMMENDATIONS:

- Open drain construction and restoration to restore a functional channel
- Several private culvert replacements due to failing and/or inadequately sized existing culverts
- In-stream BMPs throughout the drain
- Bank stabilization at several severely eroding areas

Existing conditions in the Bell Drain are extremely poor, requiring extensive cleanout, bank stabilization and culvert replacements.



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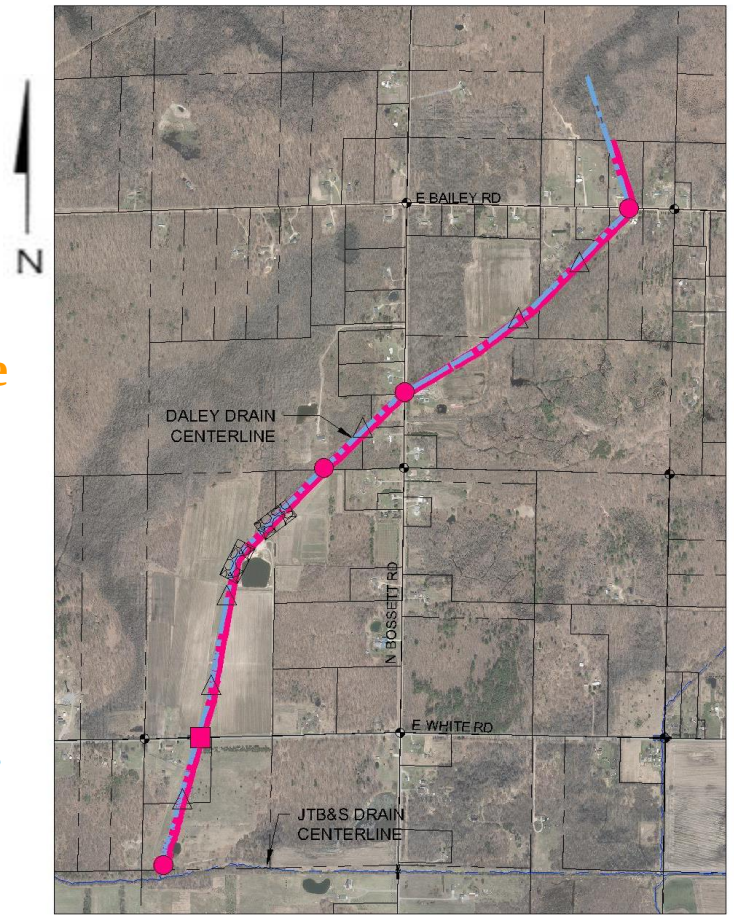
DALEY DRAIN RECOMMENDATIONS:

- Open drain cleanout
- Culvert replacement (private and public)
- In-stream BMPs throughout
- Bank stabilization at select locations to alleviate bank erosion

Existing conditions in the Daley Drain are good to fair with the exception of several private and public culverts. Open drain cleanout efforts are minimal throughout.



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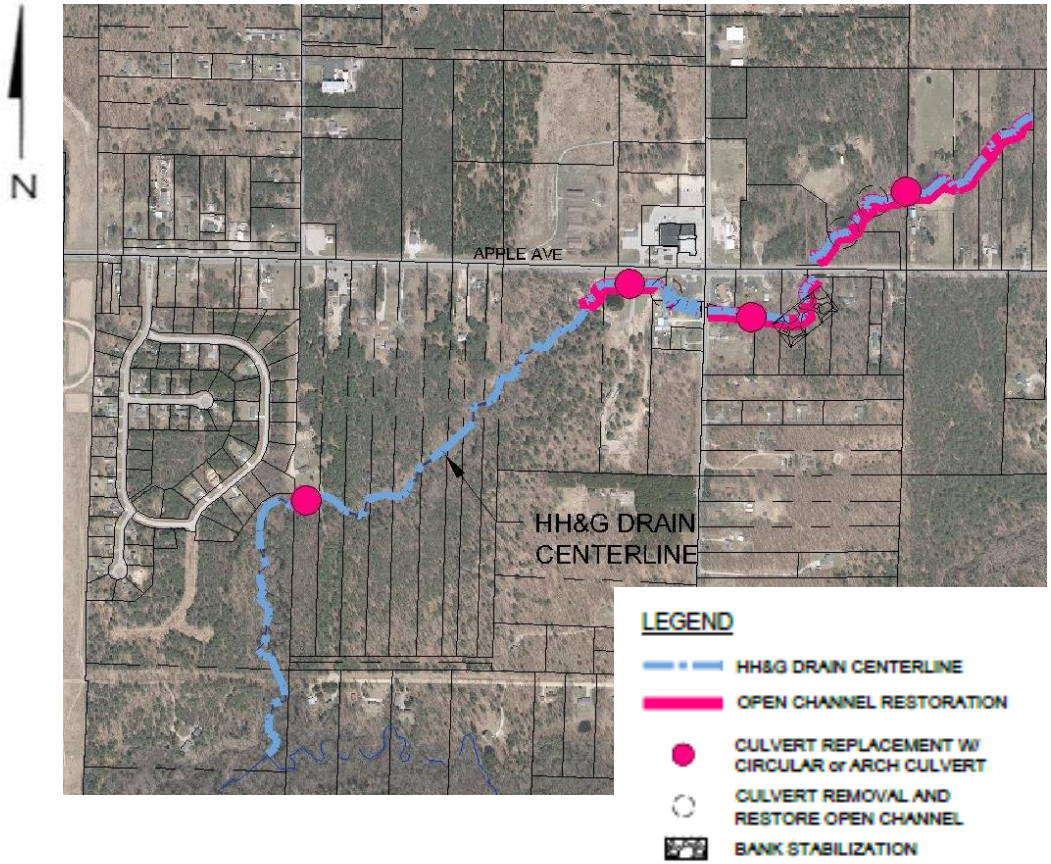
HH&G DRAIN RECOMMENDATIONS:

- Open drain restoration in the upper portion of the Drain to restore a functional channel
- Several private culvert replacements and/or removal
- Bank stabilization

Existing conditions in the HH&G Drain are poor with heavy sedimentation, inadequate culverts, and severe bank failure.



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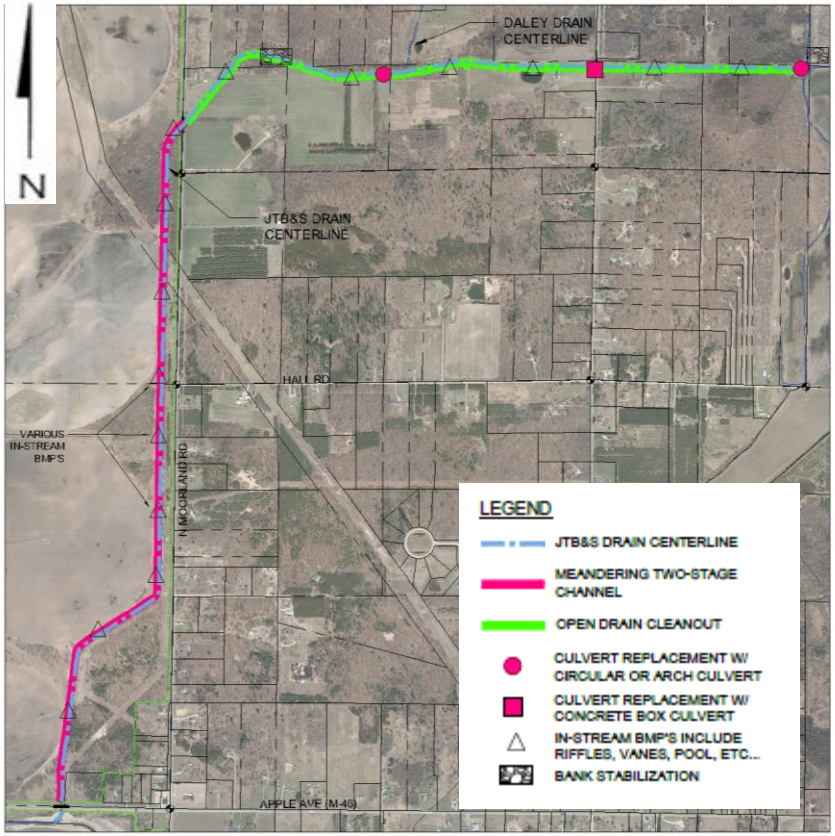

JTB&S DRAIN RECOMMENDATIONS:

- Meandering two-stage channel (where over-widened) and open drain cleanout
- Open drain cleanout in green portions are minimal.
- Public and private culvert replacements
- In-stream BMPs are proposed throughout the section.
- Bank stabilization in isolated areas.

Existing conditions in the JTB&S are fair. Ongoing sedimentation and erosion are pervasive. The lower portion is over-widened in several areas causing low velocity and stagnant conditions.

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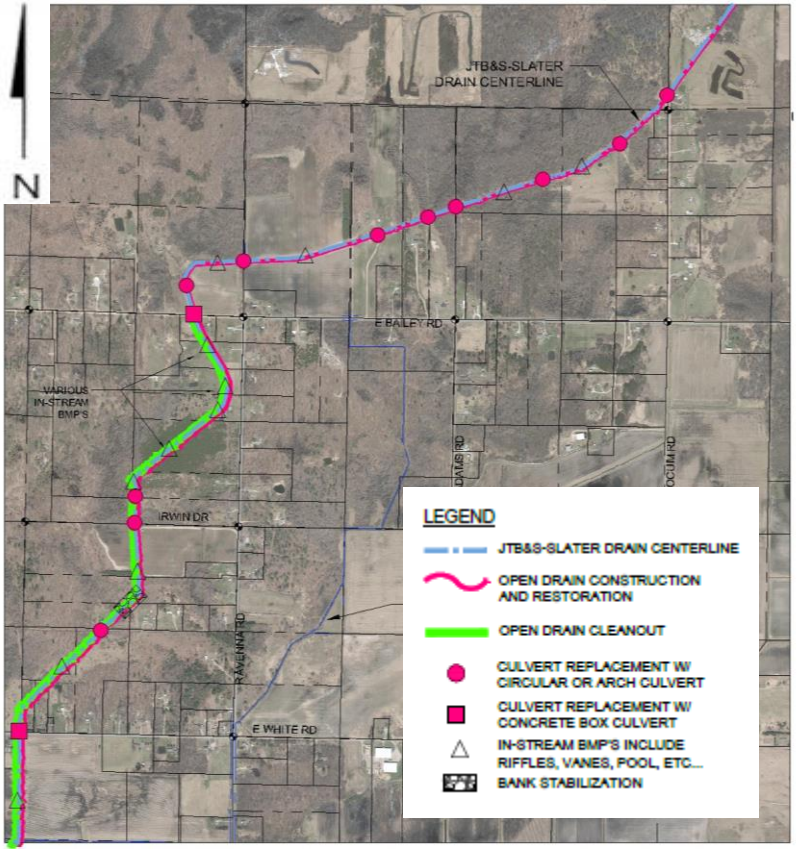
JTB&S - SLATER DRAIN RECOMMENDATIONS:



- Open drain construction and restoration where conditions have significantly deteriorated
- Open drain cleanout to remove accumulated sediment and restore proper stream grades.
- Significant public and private culvert replacements due to poor condition primarily.
- In-stream BMPs are proposed throughout the section.

Existing conditions in the JTB&S - Slater are moderate to poor. Ongoing sedimentation and erosion are pervasive. The upper portion of the drain has significantly deteriorated and requires more extensive work to restore.

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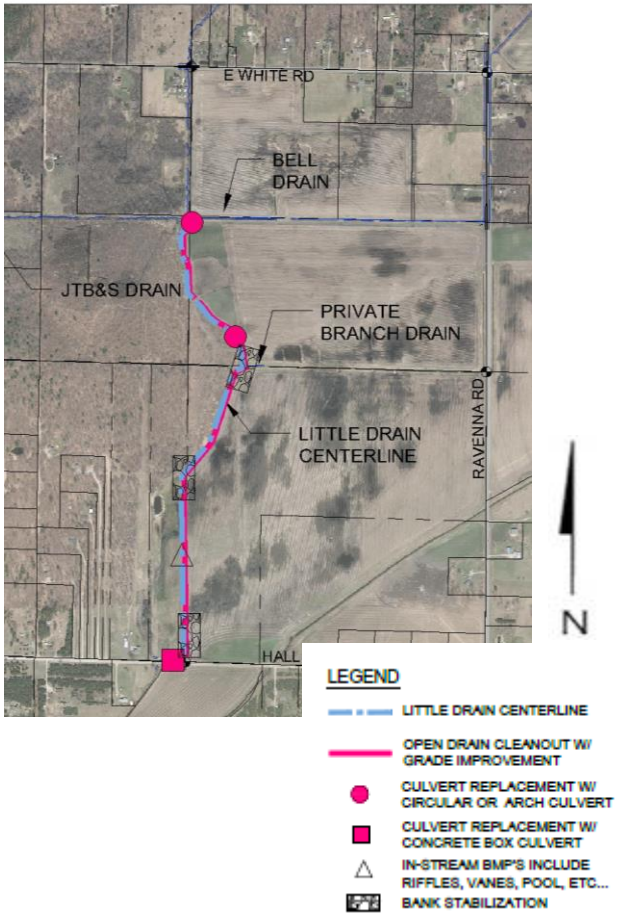
LITTLE DRAIN RECOMMENDATIONS:

- Open drain construction and restoration where the drain has been significantly over-excavated
- Open drain cleanout to remove accumulated sediment and woody debris
- Significant public and private culvert replacements due to poor condition and improper grades
- In-stream BMPs and bank stabilization measures are proposed throughout the section

Existing conditions in the Little Drain are poor. Extensive sedimentation and woody debris are pervasive and several culverts set at improper grades are further exacerbating the issues.



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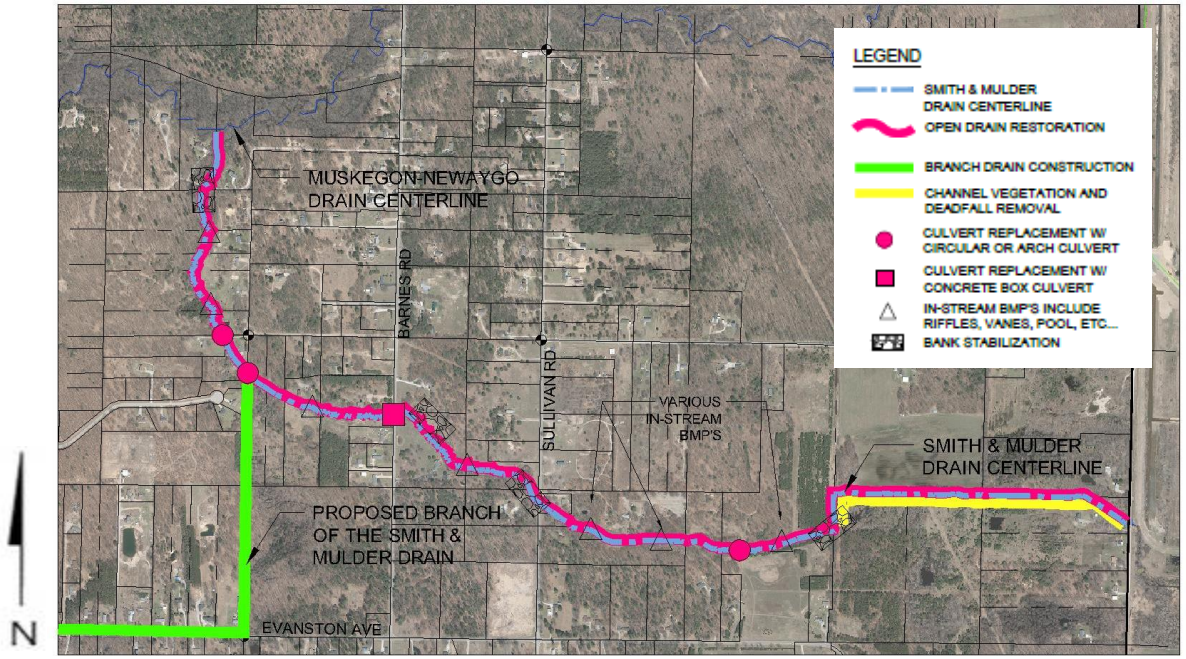
SMITH & MULDER DRAIN & PROPOSED BRANCH RECOMMENDATIONS:

- Open drain construction and restoration to return a functional and natural channel
- Branch drain construction to provide much needed flood relief to Evanston Ave.
- Several private and public culvert replacements due to conditions, and improper grade and size
- Various in-stream BMPs to improve water quality

Existing conditions in the Smith & Mulder Drain are poor overall. Extensive sedimentation accumulation, log jams, and extensive vegetation in the channel contribute to poor flow conditions.



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NEXT STEPS:

- **Finalize and procure Bid documents to Contractors tentatively set for June 25, 2020**
- **Bid Opening tentatively set for July 16, 2020**
- **Day of Review tentatively set for July 29, 2020**
- **Construct project Fall 2020 to 2022**