



Engineers' News

June 2023

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www.FortWayneEngineersClub.org



June Social



When: Thursday 6/15/2023 @ 6:30 p.m.

Address: 14613 Lima Rd., Fort Wayne IN 46818

Website: <https://fortwaynepinball.com>

Info:

Join us for a night of fun at the largest pinball arcade in Indiana and one of the largest in the world. FWEC will provide food and drinks. All are welcome.

Unfortunately club tours have ended for the summer and will pick back up again in September. The social is here to help kick off the summer.



Young Eagles offers free airplane rides to kids ages 8-17 throughout the summer. See schedule below for locations, dates, and times or view the website for information.

https://www.eaa2.org/young_eagles.php

Smith Field Airport

June 10, 2023 9:00 a.m.- 1:00 p.m.

August 12, 2023 9:00 a.m. - 1:00 p.m.

September 9, 2023 9:00 a.m. - 1:00 p.m.

DeKalb County Airport

June 17, 2023 9:00 a.m. - 1:00 p.m.

August 26, 2023 9:00 a.m. - 1:00 p.m.

Kendallville Airport

September 16, 2023 9:00 a.m. - 1:00 p.m.

May Tour Summary

The U.S. Environmental Protection Agency (EPA) had plans by 1980 for regional reductions of sewage contamination in both inland and coastal waters. The Center for Disease Control (CDC) had demonstrated meaningful cycles of disease outbreaks every summer since the 1920's from contact with local water bodies including oceans. Historically, civil engineering tended to focus on channeling rain water away from buildings. With the advent of indoor plumbing, human sewage was merely plumbed into the existing farmland, building foundation, and street drainage. These combined storm and sewage drains are known as combined sewers and still dominate urban areas developed before 1930 in the upper Midwest and Northeast of the United States.

Sewers strictly for human waste ("grey" and "black" waters) are known as "sanitary" sewers because they are essentially sealed and self contained units. They have been successively installed where possible across hundreds of square miles in our region since at least the mid-1970's. Septic tank elimination efforts continue in evermore rural or challenging areas.

To read more, click [here](#)

Items of Note

FWEC member Rod Vargo is Chair of the 28 year-old and all-volunteer [Utility Advisory Group](#), which formally advises Fort Wayne City Utilities and often City Council. Your comments are welcome at rodvargo@comcast.net

Volunteer Positions within the Club

Membership and Contact Chair: Open
Northeast Indiana DiscoverE Chair: Open

Vice President:

Club Vice President needed! It's time once again to ask club members to fill this vital spot in the club's leadership roster next year. The Vice President is generally in charge of arranging club tours, though this has traditionally been a team effort so it's not really all that much work. You would be expected to attend the monthly officers meeting (from the end of August until the end of May) and at the end of your one-year term, you would automatically become club president. The typical monthly time involved would be roughly 2 hours (including attending the officers meeting). If you enjoy the club and would like to see it continue to function, please consider volunteering for this spot.

Let us know if you're interested!

Volunteer

General Club Info

Fort Wayne Engineers Club dues are \$0. Donations are welcome but strictly voluntary. In recent years, club funds have helped support Discover-E, the Regional Science and Engineering Fair, annual bridge building contests in schools, academic awards, networking events, mentoring, our website, and facilitating free tours.

Please see FortWayneEngineersClub.org, [LinkedIn](#), or [Facebook](#) for updates on current Club activities, other news, and past newsletters.

Those participating in activities or hosting tours through FWEC do so strictly at their own risk, including disease exposures. Participation in club events is voluntary, free, nonprofit, and solely for the benefit of participants and the community at large. Anyone with an interest may participate unless restrictions are specified for specific events, such as minimum age or minimum safety attire.

Interested in hosting a tour?

Contact us today!

Host a Tour

FWEC Roster for FY2022-2023

President: Nate Berndt

Vice President: Nathaniel Wisel

Secretary: Marna Renteria

Treasurer: John Magsam

First-year Board Members: Ryan Stark, Ed Woodward

Second-year Board Member: Mike Magsam, Rod Vargo

Third-year Board Member: Dave Gordon, Bert Spellman

Editor of Engineer News: Pending

Membership and Contact Chair: Open

Northeast Indiana DiscoverE Chair: Open

Vice President: Open for FY2023-2024

Job posting and resumes listed

The club accepts both job openings from around the area, as well as resumes from those seeking employment. Please submit these to the following email address:

Info@FortWayneEngineersClub.org

Advertise in the Engineers' News

The FWEC provides advertising space within the Engineers' News.
Advertisements are only \$10 per issue and limited to ½ page of content.

Advertise Your Business

May Tour Summary Continued

In the mid-1990's, EPA suggested an economically viable choice for recalcitrant pre-depression urban areas might be bulldozing and rebuilding (given most structures were also hopelessly unsafe in other respects). Since that was generally a political impossibility, many cities were eventually forced by EPA legal actions into

experimental efforts with deep tunnel projects, then a collection of immature technologies for collecting widespread combined sewers.

Because its control efforts preceded EPA's mandates, Fort Wayne was allowed to continue pursuing alternative ideas, inadvertently buying time. Our "3RPORT" tunnel project eventually became the final choice because EPA started regulating surface runoff such as roadway trash and oils/antifreezes, because most of Fort Wayne's buildings prior to 1930 had inadequate or nonexistent foundations, and because massive amounts of undocumented infrastructure was found underground at relatively shallow depths. By then, costs and unknowns of tunneling and supporting surface infrastructure had plummeted (but were still going to total a half billion in 2005 dollars for Fort Wayne overall).

This project is also covered by reports in our May, 2016, and October, 2018, newsletters. There are also some extremely good YouTubes about TBM or Tunnel Boring Machines. Most info will not be repeated here. Fort Wayne's tunnel was bored by a rock-crushing head revolving against a 19' casing ring. These are moved forward by pistons that push between the ring and a permanent concrete tunnel liner that is installed using precast interlocking trapezoidal sections as the boring machine advances. The ring was manufactured in Germany and shipped by water to Burns Harbor in northwest Indiana, then trucked on a low-boy 7-axle semi-truck on a circuitous route due to bridge capacity restrictions and required inspections of each bridge. (Eisenhower's 1950s roadway proposals intended weights and clearances which exceeded railroad capabilities.) The ring and cutter head remain entombed in the bore after use because the 60 tons and nearly 150' vertical drop required too large and heavy a crane to be worth wrangling over old roads and bridges into Foster Park. (The steel industry's Burns Harbor is maligned by environmentalists but the only means to distribute inherently heavy items in or out of the central Midwest including modern grid transformers and wind turbine components.)

The trapezoidal sections are used to accommodate turns (up, down, or sideways) of $\approx 1.5^\circ$ per 5' of advance. The 19' bore provides a finished tunnel 16' in diameter.

The sections are each one foot thick, and the remaining 6" of clearance is needed to allow the boring machine to swing in turns. Machines have gotten stuck in earlier years elsewhere due to insufficient clearance. Slurry caulking is used to further help seal the concrete sections from the raw rock walls.

The design scheme is for excess combined sewage to enter the 5 mile long tunnel (and/or improved existing sewers) instead of the rivers during rain events. The deep tunnel flows downhill from northern Foster Park (ca. Rudisill Blvd.) some 150-220 feet under the St. Marys River channel to nearly the Tecumseh Street Bridge (Maumee River), then directly under mostly public domains to the Water Pollution

Control complex (WPC) on Dwenger Avenue. WPC facilities are typically on the lowest elevation possible without routine flooding problems, so most water entering the tunnel during high rain events will overflow at the WPC into two channels being built to direct flow through two 96" culverts into three storage ponds on the north side of the Maumee River. The three ponds already existed and have been repurposed for this use. When capacity allows, the stored combined rainwater/sewage will be pumped to the WPC system for treatment and eventual release into the river (clean enough to be potable tap water if public perception would allow reuse). The tunnel ended up at Foster Park within 2" of its intended positions, due to GPS technologies monitored by computer and a 24/7 driver, plus independent laser surveying.

The tunnel is not intended to store wastewater and will normally be pumped dry by multiple pumps in a dry well at the WPC end of the tunnel, some 250' below ground.

The dry well is massive with thousands of tons of rebar and tens of feet thick concrete, plus electrical supply. The dry tunnel concept has many advantages, including preventing buildup and solidifying of sediments which had impeded our miles of large ($\approx < 11'$ diameter) interceptors that had to be cleared. City Utilities is well on its way to producing all of its electricity due to projects improving efficiency and generating methane from anaerobic digestion of waste. One of the storage ponds will be covered this summer with solar panels on floats, which also reduces algal problems.

At Foster Park, a number of shallow-depth projects will direct massive amounts of rain-event sewage down a drop shaft into the tunnel, while also replacing significantly overage public amenities in the Park and addressing stormwater that collects behind a flood wall. Other drop shafts along river banks are being plumbed so excess combined sewage overflows into a shaft instead of the river. Each drop location has a main shaft plus a smaller air pressure equalization shaft. Each main shaft has a screen & collection system to exclude most trash (etc.) and a vortex generator to reduce the impact of falling water.

Enormous amounts of "savings" from delaying the tunnel have been "poured", where feasible, into reducing the amount of water entering the tunnel. For example, miles of existing old combined sewers have been relined with "cured in place" films to reduce underground water intrusion. Home downspouts and sump pumps have been rerouted. Some new stormwater sewers, with trash screens, have been installed where feasible despite old foundations and other concerns (search "Curdes Avenue Taskforce" for background decisions).

The drop shafts are a major challenge and expense. Wherever the tunnel is directly below a river channel (primarily to avoid claims of damage to undocumented infrastructure or building foundations), a side passage must be excavated with

explosives and bucket loaders to any drop shaft along the river bank. A significant difficulty on this project was massive amounts of water raining from the rock into the tunnel and these side passages. Thousands of gallons per minute must be managed while excavating the passage and installing a fiberglass liner (effectively a pipe) between tunnel and drop shaft. The bore is mostly in Wabash limestone which was coral reef, still riddled with original gaps between the coral and filled with a 200 foot column of water generating 100 psi. Bedrock here is capped by mostly glacial clay, which was 70 feet thick at the WPC end. The WPC drop shafts are each cased by a continuous steel cylinder. The largest cylinder is 66 feet in diameter and was dropped in place by a crane. (Some of the bore at the Foster Park end is in shallower Detroit limestone.)

Coral reefs tend to be steep vertical structures which allow cold (higher oxygen capacity) water from depth to mix with oxygen poor warm surface waters. Fissures in the formations fill with either sand or muck as sea levels change. Some downtime and added expense occurred because scoops had to be added behind the rock-crushing rollers when ancient muck was encountered.

Completion of our project is expected in early 2025, as legally agreed to with EPA. Dozens of other cities are in various phases of their combined sewer programs. Of course, all of this including trash screens will have to be maintained.

This presentation was arranged at a time of severe workload for the chief project engineer Mike Kiester. He joked that two previous chiefs already retired out of the intense pressure and workload. We greatly enjoyed and appreciated his presentation, time, and detail.

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