

# **Nolan Creek WPP Advisory Stakeholder Meeting – Minutes**

**Date:** Monday March 6, 2017

**Time:** 10:30 – 11:45 a.m.

**Location:** Killeen Transportation Center

## **Participants:**

TIAER – Anne McFarland, Leah Taylor, Elaine Smith, Haley Burger

City of Harker Heights – Mark Hyde, Joe Hines

City of Killeen – Kristina Ramirez, Deirdre Kirk

Bell County Health Department – Mike Jahns

City of Belton – Paul Romer, Jerri Gauntt (property owner as well)

NRCS – Kyle Wright

TCEQ – Megan Henson, Bill Carter

CTCOG – John Weber, Kendra Coufal

City of Nolanville – Kara Escajeda

Yalgo Engineering – Scott Brooks

## **Topics Discussed:**

### **Nolan Creek WPP Monitoring Update –**

TIAER provided attendees with an update on water quality monitoring (see Attachment #1)

1. Bar charts and a table of the raw data are presented in Attachment #1 for the six months of monthly monitoring. Monitoring stations on tributaries to Nolan Creek are colored in grey to differentiate them from monitoring stations along the mainstem of Nolan Creek/South Nolan Creek.
2. TIAER has been brainstorming on ways to better visually present these data, particularly given the distance of about 16 river miles between stations 11911 (South Nolan Ck at FM 3219) and the most downstream station, 14237 (Nolan Ck in Yettie Polk Park). Future presentations may include graphics that take distance between stations into consideration.
3. Of note with the February 2017 monitoring event – Due to safety concerns with flooding conditions, TIAER field staff were able to measure flow only at station 21926, the most upstream station on the Long Branch tributary. February 2017 also represented the highest bacteria concentrations with these flooding conditions. The other five months of monitoring represented more general or baseflow conditions.
4. Of the 10 stations currently monitored, 7 were part of the previous characterization project and plots are provided in Attachment #1 showing variation over time in bacteria concentrations. While it was pointed out that six months of data under the current project is too limited to clearly indicate any trends, the bacteria concentrations measured at Yettie Polk Park (station 14237) may be indicating a general decline.
5. The committee was reminded that after nine months of monitoring the location of monitoring stations would be revisited to see if the group would like to move any of the stations in an effort to better target sources. This discussion should occur with the next partnership meeting, which will likely occur in late May or early June.

TIAER requested questions regarding the project's routine monitoring from the committee. No attendee replied with a question.

### **Nolan Creek/South Nolan Creek Watershed Plan of Action**–

Based on meetings with the partnership group and individual entities within the Nolan Creek/South Nolan Creek watershed, TIAER compiled a “laundry list” of implementation strategies to include in the WPP (see Attachment #2). This list will be used to develop the management portion of the watershed protection plan, which if we stay on schedule will be drafted by the end of May.

TIAER asked committee attendees if this list captures everything. The following comments were received:

- Wildlife and rural areas – a comment was made by a stakeholder of the tens of thousands of black birds on power lines near Home Depot in the City of Killeen. This area would be right along Little Nolan Creek. Another location where colonies of birds roost would be near the HEB grocery store on Trimmier Road in Killeen.
  - TIAER provided that while hidden on the watershed plan of action list, this is actually on the list under the “MS4 Management of Stormwater Runoff (bacteria focus)” section. (*Bird colonies and roosting activity may need to be broken out separately from other urban wildlife as different management practices are needed to address this as a bacteria source.*)
  - It was noted by a stakeholder that the upper San Antonio WPP addresses the issue of bird roosting as a source of bacteria and it may be worthwhile to review this document to see how it dealt with for inclusion in the Nolan Creek WPP.
  - A stakeholder noted that while the list notes little hog activity in the watershed, quite a bit of feral hog activity has recently been observed in the area of the creek near Amy Lane in Harker Heights.
  - The City of Harker Heights requested that street sweeping be included in the watershed plan of action as a management measure.

Attendees were encouraged to provide feedback via email to either Anne or Leah, if they had other thoughts about the list after the meeting.

### **Low Impact Development Practices** – Bill Carter, TCEQ

The attendees were provided a presentation by Bill Carter (TCEQ) addressing Low Impact Development (LID) practices. A summary of the information is provided below and a copy of the presentation will be posted on the Nolan Creek WPP website.

- The nonpoint source (NPS) program can provide federal grants designed to fix water quality issues.
- The purpose of LID is to reduce and re-direct runoff by infiltrating it into the ground or storing it for reuse at a later time. In contrast, conventional drainage systems are designed to simply move storm water along on its way.
- As part of projects, the NPS team at TCEQ has helped in identifying city codes that would impede LID and how these could be revised to allow or promote LID practices.
- Types of LID practices include:
  - Rainwater Harvesting – used to reduce runoff and can be used for household or commercial use
  - Bio-retention – most common LID function. Some refer to bio-retention as “rain garden” – no drainage, built in vegetation that assists in making use of storm water.

- Bio-swales – filled with vegetation and porous base. Bio-swales are designed to facilitate the slowing and infiltration of stormwater runoff.

The presentation, which will be available on the project website, provided a summary of several LID projects:

- Mission Drive – in redevelopment
  - Permeable pavement that drained to a bio-swale. Bill noted that the type of pavement used in this project, Permeable Friction Course, is a porous surface layer over standard impermeable road base which drains out at the roadside rather than down to a porous base material. It is often used by the TXDOT department when building highways, because it reduces splash and spray as well as road noise in addition to reducing pollutant runoff.
- Houston – Street Drainage BMPs
  - Project incorporated rain gardens at intersections and tree boxes receiving storm drain inflows along the sidewalks
- Dallas AgriLife Center – Retention Pond
  - The center conducted a green roof experiment and a rain barrel experiment as well as demonstrating rain harvesting cisterns, permeable pavement parking spaces, a rain garden and a large retention pond
- Caldwell County Justice Center –
  - Project under construction
- San Antonio River Authority Retrofits
  - 9 separate bio retention cells
  - Cisterns
  - Permeable pavement
- Lower Rio Grande Valley
  - Permeable pavement
- Seguin Outdoor Learning Center
  - Permeable pavement, rain garden and bio-swales
- Detention Basin Retrofit – was not exactly LID
  - The outlet was modified to hold as much water in the pond as it safely could for 24 – 48 hours, then allowed the water to slowly drain out
  - Increased holding time allowed about 90 percent increase in sediment settling from the stormwater runoff and the holding time also allows increased UV disinfection of bacteria.

### Questions on presentation

Answers are provided in blue.

1. How are locations prioritized for placing bio-swales?
  - The program relies and counts on applicants to make their case on where to place bio-swales. Part of the application includes looking at load reductions that will be accomplished based on modeling.
  - The San Antonio River Authority made a LID design manual and Harris County has created a separate review track for development that involves LID.

- Additionally, the City of Austin has created an environmental criteria manual that provides exactly what type of LID designs can be used to meet stormwater treatment requirements.
2. For most features, one would think the bio-swales would silt up over time.
    - This can be a problem if there is an erosion problem along with the runoff draining to the feature. In general, infiltration increases as the vegetation grows, so siltation of the bio-swale has limited effect. Also, most features are designed to make routine removal of silt accumulation easy..
  3. With the objective to hold water, would drought conditions require a need for additional irrigation?
    - Part of the LID strategy is to make use of native and adaptive vegetation. Vegetation that is hardy so it can take the varying Texas weather conditions. Also, a deep mulch layer is used, which helps retain water. LID does require a balancing act between times when water is plenty and when lacking. The design features and recommended planting do possess a good track record in being able to handle varying conditions. Also, rainwater harvesting can provide all the water needed to maintain vegetated LID features through extended dry periods.
    - Tree boxes –
      - Example of a main problem occurred in Houston – the road construction crew did not do an adequate job of cleaning up the construction before removing tree box lid. Thus, all the sediment went into the tree box
  4. What defines a project as “shovel ready?” Previous funding sources had “ridiculous” requirements.
    - The 319 grant program is not like this and does not have specific requirements in regard to being “shovel ready.” This may not be an appropriate term to use if it has had connotations related to other previous funding opportunities. It was just used to indicate a preference for projects that are clearly defined and that do not require significant further planning before the project can be implemented.

**Some closing comments from Bill promoting LID –**

While LID may sometimes have greater upfront costs, it does not have as much infrastructure cost for upkeep. LID will solve almost all nonpoint source water quality problems if conducted correctly and enough of it is installed. LID can create a permanent solution.

**Bill noted that the current NPS funding**

1. Prioritizes implementation of WPPs
2. Focuses on restoration of impaired water bodies
3. Requires significant leveraging (cost-share) to show stakeholder commitment

The TCEQ cannot fund anything that helps the permittee meet MS4 requirements – project ideas must go over and beyond what is asked in the MS4 permit. The TCEQ NPS program team can talk about ideas anytime, except while the request for funding applications (RFA) is out. The RFGA will be released in a June/July 2017 timeframe. It will be open for about two months for applications. Applicants are generally notified of an award about four months after the RFA closes, at which time modifications to the project scope and budget may be discussed. The actual project will not begin until the following fiscal year or Sep 2018 for this cycle. With this

timeframe in mind, the next couple of month provides an opportunity to discuss potential projects with the TCEQ NPS team prior to the RFGA solicitation.

### **Discussion of Subcommittees for Nolan Creek WPP –**

TIAER noted the WPP development group has a large amount of representation among the urban portions of the watershed but is lacking representation for the rural areas. TIAER would like to obtain more representation of rural landowners, including those who own smaller acreages or ranchettes, and people with horses as well as cattle as these people can shed some insight on rural management measures.

- It was suggested to look at the landowners along Nolan Creek via the county appraisal district
  - TIAER noted that this has been completed and will try to better target some of these folks.
- It was also suggested that TIAER contact a representative from the Farm Bureau to help stir up some involvement.
- Involvement from the local SWCD was also suggested.
  - TIAER noted that a representative from the TSSWCB generally attends the WPP meetings, and would contact TSSWC about a representative from the local SWCD.

### **Conclusions –**

TIAER reviewed the timeline of progress on the WPP

- The goal is to have the Watershed Plan of Action (using the laundry list for management of activities) developed by the end of May 2017
- The goal is to have a draft of the WPP completed this fall (November 2017)

All drafts will be posted on the Nolan Creek WPP website ([www.nolancreekwpp.com](http://www.nolancreekwpp.com)) and TIAER will be in communication via email on progress.

A comment was made to review (specifically) the Lampasas WPP and the Leon WPP as the Nolan Creek watershed is sandwiched between these two.

At the next Nolan Creek Partnership meeting, which is likely occur in late May or early June, we would like to look more closely at the WPP evaluation process for monitoring the effectiveness of management measures. As part of the WPP, this will include bacteria source tracking to better define sources. We would also like to evaluate the current monitoring program and location of monitoring stations.

### **Announcements**

The next Texas Clean Water cleanup day along Little Nolan (hosted by the City of Killeen) will be held in April.

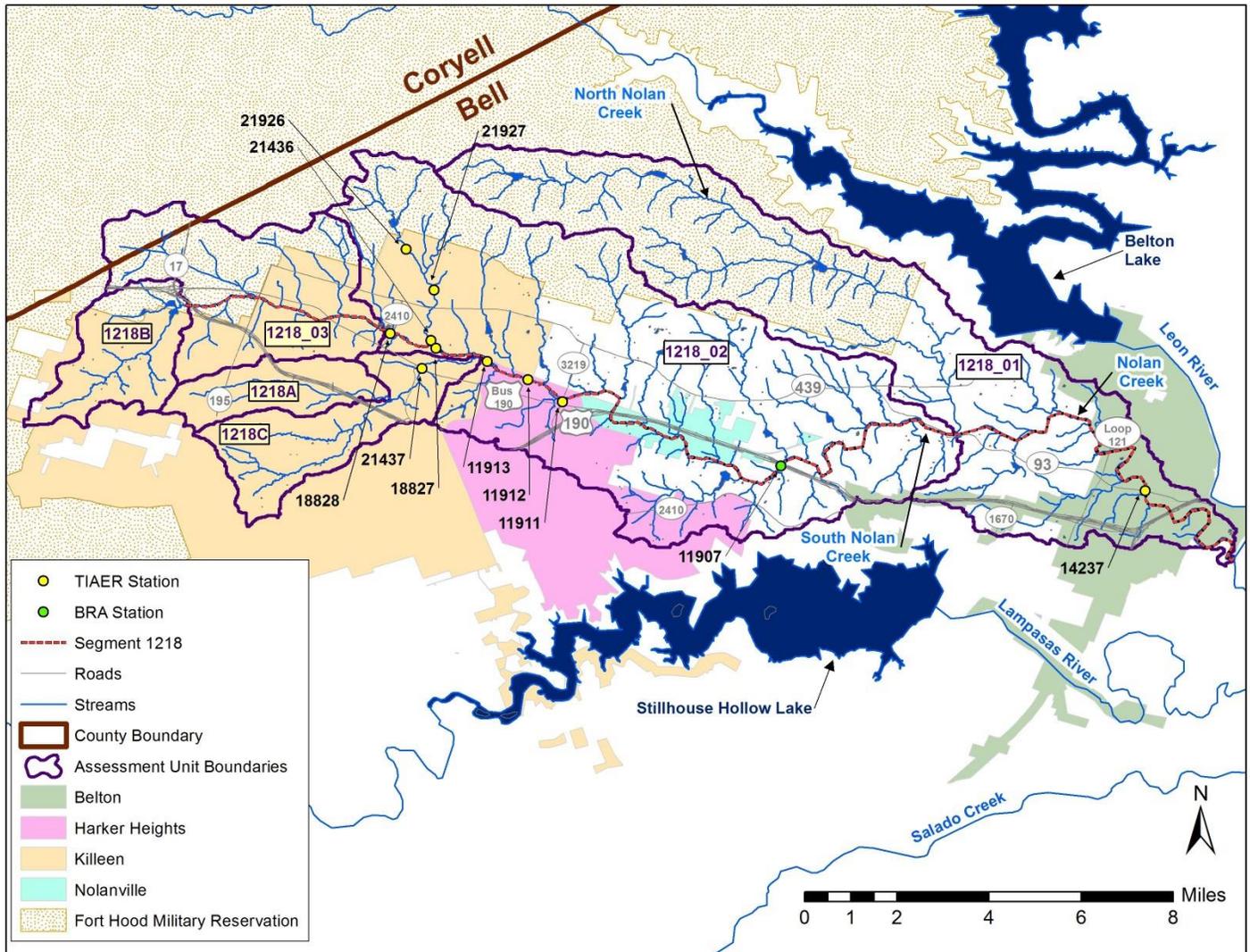
- The City of Killeen told the group that if any of their entities are hosting a cleanup day that the CENTEX Sustainability group will advertise the event for free.

### **Closing**

The next Nolan Creek/South Nolan Creek Advisory Committee Group will be held in May/June of 2017.

**Attachments**

1. Nolan Creek/South Nolan Creek Water Quality Update
2. Nolan Creek/South Nolan Creek Watershed Plan-of-Action

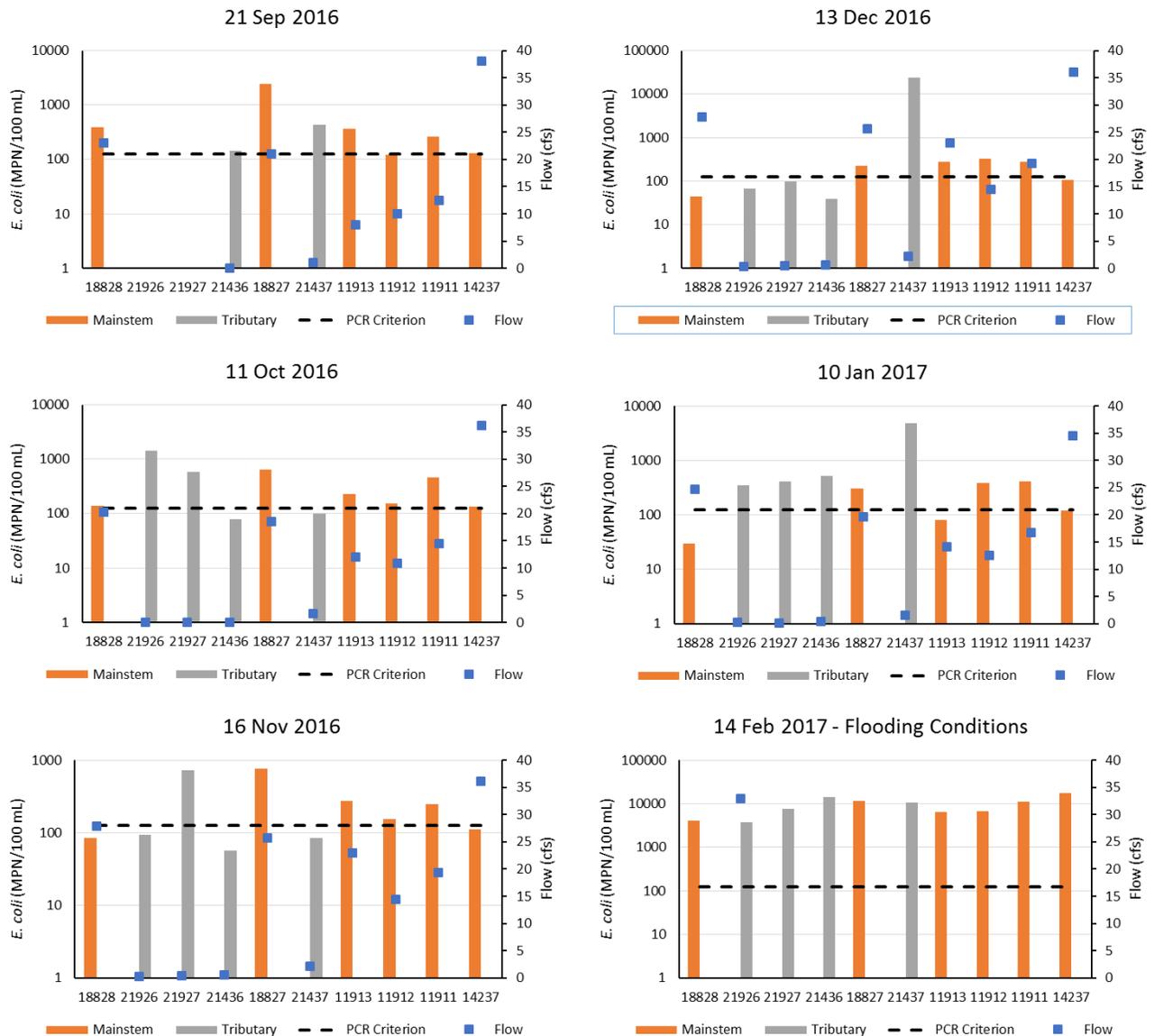


### Nolan Creek/South Nolan Creek Monitoring Data Update

TCEQ ID	Site Description	Latitude	Longitude
18828	South Nolan Creek at 38 <sup>th</sup> St in Killeen	31.108091	-97.702156
21926	Long Branch at Tripp Trail in Killeen	31.134587	-97.697216
21927	Long Branch at Lake Road in Killeen	31.121760	-97.688445
21436	Long Branch just upstream of crossing of South Nolan Creek at Twin Creek Dr in Killeen	31.105946	-97.689364
18827	South Nolan Creek at Twin Creek Dr in Killeen	31.103470	-97.687851
21437	Little Nolan Creek off US 190 in Killeen	31.097143	-97.692268
11913	South Nolan Creek at Roy Reynolds Road in Killeen	31.099382	-97.671748
11912	South Nolan Creek at Amy Lane in Harker Heights	31.093611	-97.658890
11911	South Nolan Creek at FM 3219 in Harker Heights	31.086666	-97.648056
11907	Nolan Creek at US 190 downstream of Nolanville	31.066560	-97.579500
14237	Nolan Creek at SH 93 in Belton (Yettie Polk Park)	31.058743	-97.464989

## Monthly Routine Grab Data – Preliminary Results for Bacteria & Flow Sep 2016 – Feb 2017

Stations presented in most upstream to downstream order from left to right.

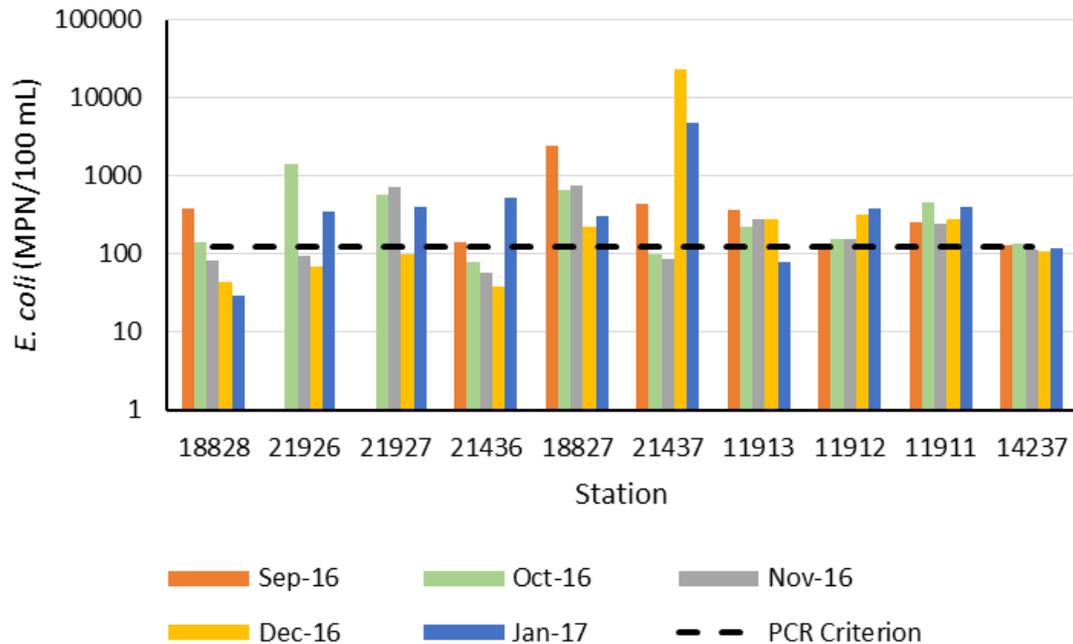


Note: Feb. 14, 2017 Nolan Creek/South Nolan Creek was in flood conditions, thus, flow could only safely be measured at 1 of the 10 stations.

Additional notes: Decreasing flows often noted between mainstem stations 18828 and 11912, then increases.

- Bell County WCID 1 Main Plant discharges into South Nolan Creek just above station 18828. Permitted discharge 18 MGD (27.9 cfs); average discharge 11.5 MGD (May 2013-Jun2015) or 17.8 cfs.
- City of Harker Heights WWTF discharges between stations 11912 & 11911. Permitted discharge 3 MGD (4.6 cfs); average discharge 1.9 MGD (2.9 cfs).
- Between stations 11911 and 14237, there are two other WWTF that discharge to South Nolan Creek, Bell County WCID Plant #3 (South Plant; permit 6 MGD; avg. 3 MGD [4.6 cfs]) and Bell County WCID 3 (permit 0.7 MGD; avg. 0.3 MGD [0.5 cfs]). South Nolan Creek also merges with North Nolan Creek prior to station 14237 on Nolan Creek. Much of the increase in flows at station 14237 is associated with flows from North Nolan Creek.

**Monthly values Sep2016 – Jan2017 compared between stations (Feb 2017 values excluded due to flooding conditions)**



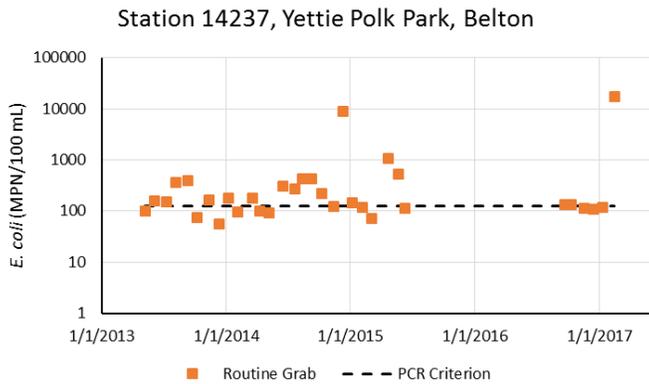
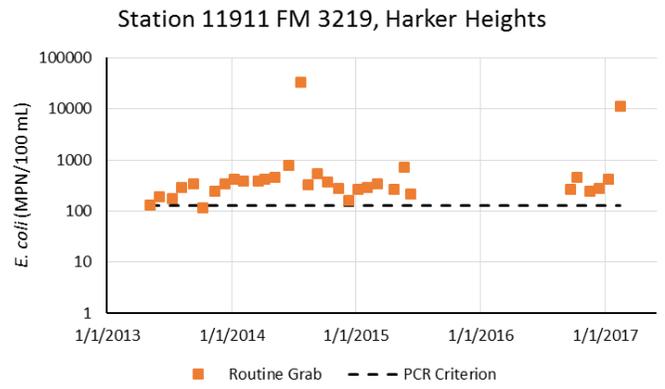
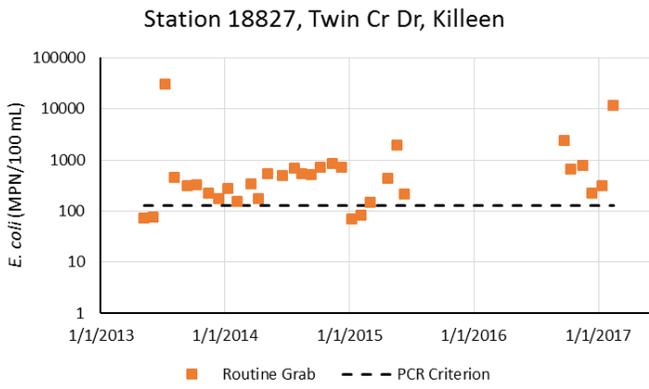
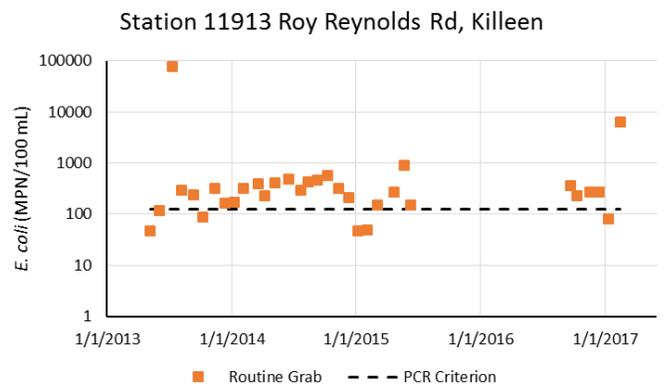
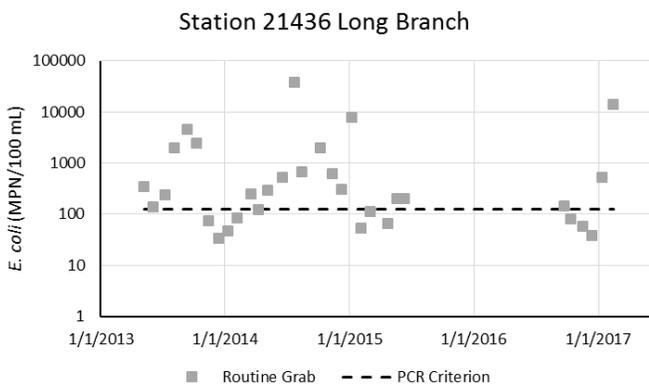
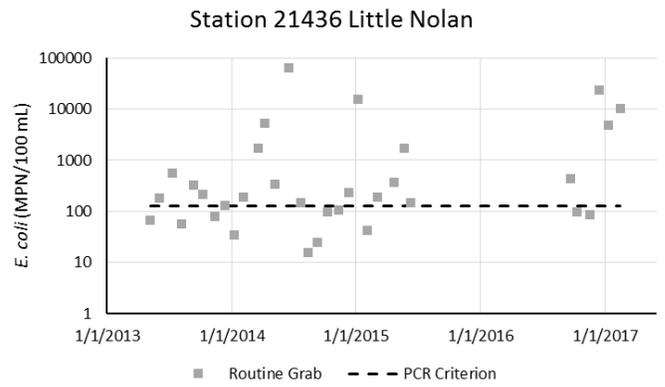
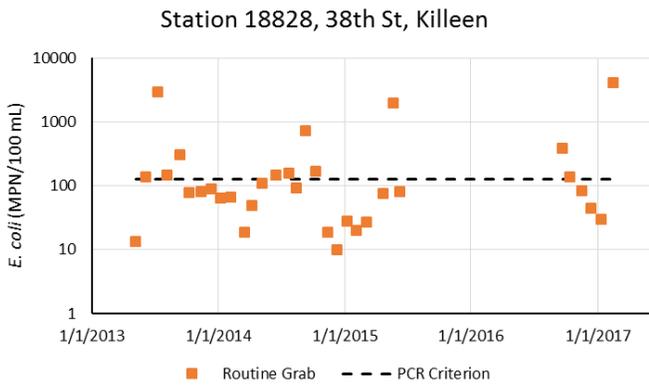
**Preliminary Data – Sep2016 – Feb2017**

Station	Brief Station Description	Collection Date	Collection Time	Flow (cfs)	Flow Comment	<i>E. coli</i> (MPN/100mL)
18828	38th St Killeen	21-Sep-16	8:46	23		390
18828	38th St Killeen	11-Oct-16	9:19	20		140
18828	38th St Killeen	16-Nov-16	10:08	28		85
18828	38th St Killeen	13-Dec-16	10:53	28		44
18828	38th St Killeen	10-Jan-17	10:31	25		30
18828	38th St Killeen	14-Feb-17	11:17		flood flows	4,100
21926	Long Branch, Tripp Trail	21-Sep-16	8:32	0	dry	
21926	Long Branch, Tripp Trail	11-Oct-16	9:03	<0.10		1,500
21926	Long Branch, Tripp Trail	16-Nov-16	9:54	0.26		93
21926	Long Branch, Tripp Trail	13-Dec-16	10:39	0.26		68
21926	Long Branch, Tripp Trail	10-Jan-17	10:17	0.33		340
21926	Long Branch, Tripp Trail	14-Feb-17	11:02	33		3,700
21927	Long Branch, Lake Rd	21-Sep-16	8:30	0	no flow	
21927	Long Branch, Lake Rd	11-Oct-16	8:48	<0.10		580
21927	Long Branch, Lake Rd	16-Nov-16	9:43	0.41		730
21927	Long Branch, Lake Rd	13-Dec-16	10:26	0.41		99
21927	Long Branch, Lake Rd	10-Jan-17	10:06	0.12		410
21927	Long Branch, Lake Rd	14-Feb-17	10:47		flood flows	7,500

## Attachment 1.

Station	Brief Station Description	Collection Date	Collection Time	Flow (cfs)	Flow Comment	<i>E. coli</i> (MPN/100mL)
21436	Long Branch nr Twin Ck Rd	21-Sep-16	8:27	0.1		140
21436	Long Branch nr Twin Ck Rd	11-Oct-16	8:32	0.10		80
21436	Long Branch nr Twin Ck Rd	16-Nov-16	9:30	0.55		57
21436	Long Branch nr Twin Ck Rd	13-Dec-16	10:13	0.55		39
21436	Long Branch nr Twin Ck Rd	10-Jan-17	9:53	0.40		520
21436	Long Branch nr Twin Ck Rd	14-Feb-17	10:31		flood flows	14,000
18827	Twin Ck Rd Killeen	21-Sep-16	8:16	21		2,400
18827	Twin Ck Rd Killeen	11-Oct-16	8:19	19		650
18827	Twin Ck Rd Killeen	16-Nov-16	9:23	26		770
18827	Twin Ck Rd Killeen	13-Dec-16	10:04	26		230
18827	Twin Ck Rd Killeen	10-Jan-17	9:43	20		310
18827	Twin Ck Rd Killeen	14-Feb-17	10:15		flood flows	12,000
21437	Litte Nolan US 190 Killeen	21-Sep-16	8:04	1.0		440
21437	Litte Nolan US 190 Killeen	11-Oct-16	8:06	1.7		99
21437	Litte Nolan US 190 Killeen	16-Nov-16	9:12	2.2		86
21437	Litte Nolan US 190 Killeen	13-Dec-16	9:52	2.2		24,000
21437	Litte Nolan US 190 Killeen	10-Jan-17	9:32	1.5		4,900
21437	Litte Nolan US 190 Killeen	14-Feb-17	10:00		flood flows	10,000
11913	Roy Reynolds Rd Killeen	21-Sep-16	7:51	7.9		370
11913	Roy Reynolds Rd Killeen	11-Oct-16	7:51	12		230
11913	Roy Reynolds Rd Killeen	16-Nov-16	8:59	23		280
11913	Roy Reynolds Rd Killeen	13-Dec-16	9:40	23		280
11913	Roy Reynolds Rd Killeen	10-Jan-17	9:18	14		79
11913	Roy Reynolds Rd Killeen	14-Feb-17	9:44		flood flows	6,300
11912	Amy Lane Harker Heights	21-Sep-16	7:36	10		120
11912	Amy Lane Harker Heights	11-Oct-16	7:33	11		160
11912	Amy Lane Harker Heights	16-Nov-16	8:45	15		160
11912	Amy Lane Harker Heights	13-Dec-16	9:09	14		330
11912	Amy Lane Harker Heights	10-Jan-17	9:03	13		390
11912	Amy Lane Harker Heights	14-Feb-17	9:24		flood flows	6,800
11911	FM 3219 Harker Heights	21-Sep-16	7:23	12		260
11911	FM 3219 Harker Heights	11-Oct-16	7:18	15		460
11911	FM 3219 Harker Heights	16-Nov-16	8:32	19		250
11911	FM 3219 Harker Heights	13-Dec-16	8:53	19		280
11911	FM 3219 Harker Heights	10-Jan-17	8:48	17		410
11911	FM 3219 Harker Heights	14-Feb-17	9:04		flood flows	11,000
14237	Yetie Polk Park, Belton	21-Sep-16	6:56	38		130
14237	Yetie Polk Park, Belton	11-Oct-16	6:48	36		130
14237	Yetie Polk Park, Belton	16-Nov-16	8:04	36		110
14237	Yetie Polk Park, Belton	13-Dec-16	8:26	36		110
14237	Yetie Polk Park, Belton	10-Jan-17	8:22	35		120
14237	Yetie Polk Park, Belton	14-Feb-17	8:35		flood flows	17,000

Attachment 1.



**Comparison of *E. coli* Concentrations over Time**

## **Nolan Creek/South Nolan Creek Watershed Plan-of-Action**

The Watershed Plan-of-Action includes watershed needs and opportunities that address water quality issues within the watershed.

**Summary of Implementation Strategies** – Most of activities listed are already addressed at varying levels within MS4 permit requirements and stormwater management plans as well as other programs within the watershed.

A purpose of the WPP is to

1. Recognize on-going or planned activities to aid in:
  - Creating synergy between them and
  - Extending support for these efforts
2. Identify additional implementation activities focusing on
  - New target areas or
  - Sources not currently addressed

**General Categories, Activities & Control/Management Strategies:** (identified to date)

(Note: Municipalities include housing areas of Fort Hood)

- **Wastewater Treatment Facilities**
  - Discharge of effluent
    - Treatment – monitoring of volume & bacteria concentration (permit)
    - Diversion of some wastewater flows outside the watershed area (i.e., into Trimmier Creek)
    - Water reuse plans (municipalities)
  - Population growth
    - Evaluation of future infrastructure needs (WCIDs & city planning)
- **Municipal Sanitary Infrastructure of Sewer Collection System** (municipalities)
  - Leaks from the collection systems sewer lines & lift stations
    - Infrastructure evaluation of sanitary sewer system
    - Lift station & sewer line rehabilitation
    - Evaluation of sewer system needs with population growth
  - Leaks in private lines connecting to sewer collection system (individual homeowners & areas, such as manufactured home communities, where more than one home is connected prior to entering the municipal collection system)
    - Detection (homeowner education)
    - Maintenance education
    - Who is responsible for fixing these leaks? (homeowner, but the city becomes responsible if a leak is not contained within the boundaries of the homeowner's property)
  - Municipal SSO prevention & screening (MS4 permits) – root balls & grease often the problem
    - Fats, Oil & Grease programs & participation (education, recycling & city ordinances)

- Screening for sewer leaky lines (city programs)
- **MS4 Infrastructure for Stormwater runoff urbanized areas (permit)**
  - Screening of stormwater pipes & drains
    - Illicit discharge detection & elimination (IDDE programs) for illegal sanitary connections to stormwater drains (city ordinances & investigations)
    - Biofilm assessment and removal
    - Dry weather screening
  - Illegal dumping of plant matter, litter, sediment or other inappropriate materials into storm drains
    - City ordinances, waste pickups, education & signage
- **MS4 Management of Stormwater Runoff (bacteria focus)**
  - General stormwater runoff
    - Drainage improvement – incorporation of more green space and riparian buffer zones
    - Education regarding what goes on the land can runoff, particularly during heavy rainfall events (pet waste, fertilizer, trash, etc)
    - Promotion of Low Impact Development options
  - Porta-Potties
    - Siting and management (city ordinances)
  - Trash
    - Proper disposal by homeowners, businesses & industry and management of trash dumpsters & garbage trucks (city ordinances)
    - Trash pickups days focusing on waterways – (e.g., Texas Waterway Cleanup) – outside municipal boundaries trash pickups might be sponsored by the County
    - Hazardous waste disposal days for municipal & county areas
  - Homeless
    - Evaluation of severity of problem (exists, generally as individuals under bridges rather than large encampments)
    - Support of services to reduce homelessness
  - Pet waste disposal (city ordinances)
    - Pet poo stations within parks & along hiking trails
    - Pet poo stations in high density housing areas that allow pets (e.g., apartment complexes & mobile home parks)
    - Pet waste management protocols for veterinary clinics, pet boarding facilities and other areas with high animal densities
    - Pet waste pollution awareness campaigns (e.g., good signage Mickey’s Dog Park in Killeen and plenty of pet waste stations and supplies, but still problems with getting people to clean up after their animals)
  - Feral cat colonies (city ordinances)
    - Evaluate need for management (trapping, sterilization & vaccination)
  - Naturally-occurring & human attracted wildlife, such as bird colonies (e.g., grackles, pigeons, swallows, etc), rodents or large concentrations of small mammals (e.g., raccoons, squirrels, opossums, skunks) and waterfowl
    - Density evaluation – (waterfowl in some park areas may be an issues but in general no large concentrations of wildlife identified)

- If density becomes an issue, then consult with TPWD on strategies to reduce food, shelter and habitat in areas with overpopulated wildlife or possibly population control efforts
    - Enforce urban trash management practices
    - Educate public to discourage feeding of wildlife and waterfowl (TPWD technical & educational support), so wildlife density does not become an issue
- **Dry Weather Urban Flows** - potentially mobilizing surface-deposited bacteria
  - Lawn irrigation, car washing, power-washing, pools/hot tubs, etc.
    - Education programs to reduce dry weather flows (water conservation)
    - Inspection of commercial trash areas, grease traps, wash down practices (city ordinances)
- **Onsite Sewage Facilities**
  - Leaky or failing septic systems
    - OSSF educational materials targeting new homeowners & real estate agents
    - Workshops on OSSF maintenance (AgriLife)
    - Continuation and extension of the Septic Tank Elimination Program (STEP) in Killeen, the “Home Grant” program in Belton and similar programs to move homes within CNNs from OSSFs to central sewer systems
    - Maintenance or replacement of failing OSSFs in rural areas
    - Database to identify locations of permitted and grandfathered OSSFs
      - Map of subdivisions and their age would aid in identifying areas for targeting in that older subdivisions with likely older systems
      - Density along or near riparian areas also more likely to be an issue
    - Increased efforts between BCHD & municipalities to work with homeowners with OSSFs within city boundaries, particularly in areas where it is not feasible to connect to a centralized sewer collection system
    - Recommendations of increased fines for compliance issues to make sure the problem “gets fixed”
    - Recommendation to TCEQ of required inspections for anaerobic OSSF systems (maybe once every 5 yrs)
    - Recommendation to TCEQ for more oversight of companies conducting inspections of OSSFs
    - Recommendation of incentives aimed at builders of subdivisions outside municipal boundaries to put in small centralized systems rather than individual on-site systems (cost main issue)
    - Recommendation that minimum lot size for OSSFs be increased, ½ acre is too small
- **Agricultural Livestock** (farmers & ranchers, should include ranchettes outside and within MS4 boundaries) – target those with property along riparian corridors
  - Livestock management of cattle & horses primary target (some sheep & goats) - grazing density & distribution
  - Management of fertilizer (organic & inorganic) primarily on pasture & some cropland
    - TSSWCB Water Quality Management Plans (WQMPs)
    - NRCS technical assistance programs

- AgriLife Extension educational programs
- **Wildlife in Rural or Open Areas**
  - Birds nesting under bridges
    - Density evaluation
    - Evaluation of deterrents in high density locations
  - Whitetail deer management
    - Density evaluation
- **Other Types of Animals**
  - Feral Hogs
    - Density evaluation (appears not to be a large issues in the urban areas of the watershed, but noted more along the North Nolan Creek riparian area)
    - Trapping or other efforts to reduce population in high density areas
- **Floodplain Management**
  - Influences runoff, streambank erosion, and movement of sediment, bacteria and other pollutants associated with stormwater runoff
    - Targeted outreach to people with backyards or land within riparian areas (abutting the creek or its tributaries) as flooding is most likely to have an impact on and from these lands
    - Work with the Floodplain Management Plan being developed by the Central Texas COG for Nolan Creek – may lead to regional bioretention station(s) and evaluation of current flood control reservoirs in the watershed as well as other recommendations that the WPP should support
- **Hike and Bike Trails** – increase human density near creeks and recreational use of these waters
  - Potentially could increase trash and waste in creeks due to increased usage
  - Potentially increase wildlife and waterfowl population densities, if feeding along these trails increases
    - Incorporation of hike & bike trails into drainage ways aids in improving drainage by increasing green space near creeks
    - Educational opportunity to increase awareness of the value of creeks and natural waterways and how to keep them clean
    - Educational opportunity along trails and within parks regarding safe ways to recreate in and around Nolan Creek (encourage secondary contact recreation activities rather than primary) and risk factors associated with recreation in the creek
    - Work with Bike-Ped initiative included various municipal planning efforts as well as the area-wide initiative through the Central Texas COG