FDOT District 4 – Safety Program

FM# 429650-4-32-01
FM# 424855-4-32-01
Continuing Services for Safety Studies and Road Safety Audits
Scope of Services

I. GENERAL REQUIREMENTS

This exhibit forms an integral part of the agreement between the State of Florida Department of Transportation (hereinafter referred to as the department) and the Consultant relative to the development of traffic safety studies and other safety related tasks to be performed by the consultant as directed by the Department.

The general purpose of this contract is to provide the, or its designee (hereinafter referred to as the department project manager), with professional services for conducting needed safety studies. The analysis and conceptual recommendations produced by the Consultant will provide valuable input into the development of safety projects targeting the emphasis areas of the Florida Strategic Highway Safety Plan (FSHSP). For the most part, these projects are implemented through the Department's work program.

Other tasks assigned to the Consultant may include but not limited to:

- Help resolve complaints or requests received from concerned citizens
- Review fatal crashes
- Monitor safety in specific work-zones
- Update and maintain the Department's Skid Hazard Reporting System
- Develop and utilize GIS based tools to identify locations with targeted crash patterns
- Review permits for special events from a safety/traffic operations perspective
- Analyze traffic signal structures (i.e., mast arms or strain poles) in order to determine if they can accommodate the signal heads necessary to change the current phase

II. PERSONNEL

The Consultant's work shall be performed and/or directed by the key personnel identified in the technical/fee proposal presentations made by the Consultant. Any changes in the indicated personnel of the Consultant's office in charge of the work as identified in the Consultant's proposal shall be subject to review and approval by the Department.

At a minimum, the Consultant's local team shall be made up of:

	Position	**Minimum Area(s) of expertise** (for the team making up each category)
1.	Project Manager	traffic engineering, safety engineering, signal retiming, QA/QC, scheduling, presentation, and communication skills

	Position	Minimum Area(s) of expertise (for the team making up each category)
2.	Engineer 2	Traffic engineering, safety engineering, cost estimation, minor design
3.	Engineer 1	Traffic engineering, safety engineering, conceptual design, roadway lighting, cost estimation, minor design
4.	Engineer Intern	Traffic engineering, safety engineering
5.	Engineer Technician	Microstation, MS-Office
6.	Transportation Data Technician	Data collection equipment use and maintenance
7.	Transportation Data Analyst	GIS, MS-Access, Other databases
8.	Community Outreach Specialist	H.S. graduate or equivalent, and 3-10 years of public information experience. Please refer to CEI Scope, if necessary.

These positions may be referenced slightly different in Exhibit "B".

A. Project Manager

The project manager shall be a registered Professional Engineer (PE) in the State of Florida.

Because of the specialized nature of the work that will be assigned, the Department prefers a project manager who is registered as a Professional Traffic Operations Engineer (PTOE).

The Consultant project manager shall have no less than 15 years of traffic engineering and safety engineering experience with at least 10 year of post registration experience.

The Consultant project manager shall have a demonstrated ability to perform Quality Control / Quality Assurance checks on a variety of traffic safety studies/reports and technical memorandums.

The Consultant project manager shall be knowledgeable of project scheduling techniques, and shall have a working knowledge of Microsoft Project, or a compatible project management/scheduling software.

B. Engineer 2

Each senior engineer shall be licensed as a Professional Engineer (PE) in the State of Florida. The group of local senior engineers shall, at a minimum, have expertise in the following areas:

1. At least one senior engineer shall have 10+ years of traffic engineering experience
2. At least one senior engineer shall have 10+ years of safety engineering experience
3. At least one senior engineer shall have 7+ years of experience in the development of minor design plans
4. At least one senior engineer shall have 7+ years of experience in cost-estimation and benefit calculation

C. Engineer 1

The group of local engineers in the Consultant's team shall, at a minimum, have the following areas of expertise:

1. At least one engineer shall have at least 6 years of traffic engineering and safety engineering experience. Typical assignments in safety/traffic engineering include:
    a. Identifying potential study locations consistent with the Florida Strategic Highway Safety Plan
    b. Retrieving project information and construction history of potential study locations utilizing FDOT resources
    c. Retrieving and analyzing traffic and crash data (from the Department's CAR system and hard copy crash reports)
    d. Conducting field reviews to assess safety and operational conditions
    e. Performing complex safety and operational analyses of intersections and arterials for existing and proposed conditions
    f. Developing signing and pavement marking plans
    g. Conducting traffic signal warrant analyses
    h. Conducting left-turn phase warrant studies
    i. Conducting pedestrian safety studies
    j. Conducting safety reviews for 3R projects
    k. Developing engineering countermeasures that are viable for implementation
    l. Preparing construction cost estimates
    m. Calculating the Benefit to Cost ratio of a proposed safety project
    n. Calculating the Net Present Value of a proposed safety project
    o. Preparing technical memorandums summarizing findings and recommendations
    p. Reviewing work performed by CAD and field technicians
2. At least one engineer shall have 5 years of experience in roadway lighting. Typical assignments in roadway lighting include:
    a. Measuring existing levels of illumination
    b. Assessing if existing illumination meets the Department's minimum requirements for that road's classification
    c. Making lighting level recommendations to address safety concerns
3. At least one engineer shall have 5 years of experience in minor design. Typical assignments in minor design include:
    a. Developing complete and error free roadway plans suitable for bidding (ex., median opening modification, intersection expansion, etc)
    b. Developing design plans for minor structures (ex., mast arm signal, overhead cantilever sign, etc)
    c. Developing design plans for lighting systems

D. Engineer Intern

The group of local engineers in training in the Consultant's team shall, at a minimum, have the following areas of expertise:

1. At least one engineer shall have 2 years of traffic engineering experience, and 2 years of safety engineering experience. Typical assignment in safety/traffic engineering include:

a. Identifying potential study locations consistent with the FL-SHSP
b. Retrieving project information and construction history of potential study locations utilizing FDOT resources
c. Retrieving and analyzing traffic and crash data (from the Department's CAR system and hard copy forms)
d. Conducting field reviews to assess safety and operational conditions
e. Performing safety and operational analyses of intersections of existing and proposed conditions
f. Conducting safety reviews for 3R projects
g. Preparing construction cost estimates
h. Calculating the Benefit to Cost ratio of a proposed safety project
i. Calculating the Net Present Value of a proposed safety project
j. Reviewing work performed by CAD and field technicians

E. Engineer Technician

The group of local office technicians in the Consultant's team shall, at a minimum, have the following areas of expertise:

2. At least one technician shall have 2 years of Microstation experience. Typical assignments include:
    a. Drawing collision diagrams
    b. Drawing condition diagrams – representing existing conditions
    c. Drawing conceptual improvement diagrams – representing proposed conditions
    d. Developing maintenance task work orders as directed by the Department project manager
3. The same technician shall have at least 3 years of Microsoft-Office experience
4. The same technician shall be able to learn and become proficient in the use of:
    a. FDOT's section number, node list, and mile point systems.
    b. FDOT's CARS database

F. Transportation Data Technician

The group of local data collection technicians in the Consultant's team shall have at least 1 year of experience in data collection. The Consultant must ensure that the Data collection technicians are knowledgeable in the use, maintenance and calibration of the equipment they use

G. Transportation Data Analyst

The group of local GIS programmers in the Consultant's team shall be proficient in the use of ArcGIS and have at least 4 years of experience in the development of GIS based applications

III. SUBCONTRACTING

Should the Consultant require the services of a specialist, the Consultant is authorized to subcontract these services under the provisions of the standard Consultant agreement. Firms selected for subcontracts must be approved in writing and qualified by the Department prior to the Consultant authorizing any such work. The Consultant shall be fully responsible for the satisfactory performance of all subcontracted work.

IV. BEGINNING AND LENGTH OF SERVICES

Services to be provided by the Consultant under this agreement will be initiated and completed as directed by the department project manager on each task work order assigned under this agreement. Individual assignments will be issued to the Consultant during the time period this agreement is in effect or as otherwise extended. The duration of services may be extended by a Time Extension Amendment if mutually agreed to in writing by the Department and the Consultant.

V. ISSUANCE OF TASK WORK ORDERS

The department's project manager shall issue a written work order authorizing the Consultant to perform one or more assignments. The Consultant shall not begin any work prior to receiving a signed task work order document. Such a task work order shall serve as a Notice to Proceed effective on the date specified in the task work order form.

The work order issued by the department's project manager shall, at a minimum, specify:

- the type of work to be conducted
- the location and project limits (if applicable)
- the date on which the final deliverable is due
- the total price to be paid to the Consultant

Due to the nature of the work to be assigned to under this contract, Consultant staff may be required to work at the FDOT Safety office. Such a requirement will be specified in the task work order.

VI. BASIS OF PAYMENT

Each study shall be priced individually and paid for as such.

When more than one assignment is issued simultaneously, regardless of whether it is issued through one or multiple task work orders, payment shall be negotiated based on the expected reduction in the staff-hour effort caused by economies of scale.

Assignments that require significant additional effort than the average negotiated task shall be submitted with staff-hour estimates for each task. Whenever deemed necessary by the Department, the total payment for an assignment shall be negotiated between the Department and the Consultant.

VII. SEALING OF FINAL DOCUMENTS

All final study reports and memorandums submitted to the department project manager, unless otherwise notified in writing by the department project manager, shall be signed, sealed and dated by a Professional Engineer licensed in the State of Florida.

VIII. EXPECTED ASSIGNMENTS

The following list includes various Traffic Operations / Safety studies that the Department anticipates assigning to the Consultant. However, since the work to be assigned to the Consultant depends on the safety issues that are identified throughout the District, the Department does not guarantee that the Consultant will be assigned a minimum number or type of studies. The type of studies includes:

A. Safety reviews
B. In-house support services
C. Safety study (includes pedestrian/bicycle safety study)
D. Structural analysis of traffic structures
E. Fatal crash review
F. Skid Hazard Reporting System update
G. Geographic Information Systems (GIS) application development
H. Net Present Value driven studies
I. Road Safety Audits
J. Data collection
    1. Automatic data recorder (ADT) counts summarized by
        a) 24-hour (1-day) traffic count (15-minute intervals)
        b) 48-hour (2-day) traffic counts (15-minute intervals)
        c) 168-hour (7-day) traffic counts (15-minute intervals)
        d) 336-hour (14-day) traffic counts (15-minute intervals)
    2. Turning movement counts (TMCs)
        a) 4 hour turning movement and/or pedestrian counts
        b) 6 hour turning movement and/or pedestrian counts
        c) 8 hour turning movement and/or pedestrian counts
    3. Pedestrian volume counts
    4. Pedestrian group size studies
    5. Vehicle gap size studies
    6. Vehicle spot speed studies
    7. Vehicle classification surveys
        a) 24-hour vehicle classification counts (15-minute intervals)
        b) 48-hour vehicle classification counts (15-minute intervals)
K. Qualitative Assessments
L. Desktop Reviews
M. Other services
    1. Public Outreach
    2. Field reviews
    3. Crash analysis
    4. No-passing zone study
    5. Lighting
        a) Highway lighting justification
        b) Illuminance measurement

c) For turning movement counts

6. **Spot speed study**
7. **Safe curve speed study**
8. **Conflict analysis**
9. **Fixed object inventory**
10. **Railroad crossing preemption study**
11. **Sight distance study**
12. **Signal warrant analysis**
13. **Operational analysis for intersections**
14. **Operational analysis for arterials and networks**
15. **Miscellaneous services**

IX. TASK DESCRIPTION

A. Safety Review

The District Safety Office is tasked with supporting the Department's resurfacing, reconstruction and rehabilitation (3R) program by developing a Safety Review for each project. The purpose of this study task is to identify significant crash patterns and recommend actions aimed at enhancing safety on locations that are programmed for 3R projects.

Under this task, the Consultant shall be responsible for:

1. Obtaining and analyzing all data necessary for the performance of the Safety Review. The data shall include, but is not limited to:
    a. The scope of the 3R project, if available
    b. The department high crash lists — spot and segment
    c. Crash data for the most recent 3 years available, from the following sources:
        i. Department's crash database
        ii. Databases maintained by other agencies (ex., cities, counties, law enforcement agencies, etc.)
2. Meeting with local government representatives/officials and groups of concerned citizens, if any, and document any safety concerns they may have
3. Analyzing crash data and identifying discernible crash patterns. At a minimum the Consultant shall create the following graphs and tables for analysis:
    a. Graphs:
        i. Crashes per study year
        ii. Crashes by type
        iii. Crashes by contributing cause
        iv. Distribution of crashes by locations of interest (ex., signalized, non-signalized intersections, median openings, ramp, etc.)
    b. Tables
        i. High crash spots
        ii. High crash segments
        iii. Collision summary by type
        iv. Collision summary by contributing cause

v. Crash summary by location — assigning the rows to the locations of interest, and the columns to the crash types, and highlighting crash patterns that need further study

4. Conducting a field review during a peak hour (to be determined by the Consultant based on the period where most crashes occur) and identify probable causes for the crash patterns identified
5. Preparing a technical memorandum containing the findings of the crash data review, interviews with local officials, and the probable causes for the crash patterns identified
6. Recommending, for each crash pattern identified, if an additional study needs to be conducted.

1. Task products

This task will be deemed completed after the following submittals are received and approved by the Department:

- Final Technical memorandum. Prior to submitting the final technical memorandum, the Consultant shall submit the document as a draft. If changes need to be made, the Department will request a modified draft. The final technical memorandum shall be submitted only after an acceptable draft, which generates no comments from the Department is submitted. It is expected that the number of drafts submitted to the Department will vary based on the quality of the submittal. The final technical memorandum shall contain the name and contact information of the Consultant's engineer who managed the task.
- Crash summary tables. Each submission of the draft and the final technical memorandum shall be submitted with the supporting crash summary tables. The crash summary tables shall be developed using a spreadsheet compatible with MS-Office Excel 2016 and submitted to the Department in an electronic format.

2. Performance time

When a single safety review is issued in a task work order, the Consultant shall be provided 15 working days to conduct a Safety Review and submit a first draft to the Department. The calendar days begin counting on the day the task work order is issued.

The Department will prioritize the Safety Reviews whenever multiple Safety Reviews are issued in the same task work order. When this occurs, the Consultant shall submit the first draft of the highest priority Safety Review within the first 15 working days while the first draft for the second Safety Review, in terms of priority, shall be provided seven working days later — that is, within the first 22 working days. This same seven working day increment shall be applied for each additional Safety Review assigned.

Should the Department provide the Consultant comments on a Safety Review's first draft, the Consultant will be provided five (5) additional working days to submit a second draft.

Should the Department have comments on the second draft, or in any other subsequent draft, the Consultant will be given three (3) extra working days to implement the comments and submit a revised draft.

3. Format of submittals

All submittals, drafts and final document, shall be submitted to the Department in the following manner, unless directed otherwise by the Department's project manager:

1. One (1) Hard copy (i.e., print), and
2. Electronic formats (2 CD-ROMs (or DVDs), which are:
    a. pdf, and
    b. the documents' native format (ex., MS-Word, MS-Excel, etc.

B. In-house Support Services

At the Department's request, the Consultant shall make available the services of any of the positions identified in the "personnel" section of the scope of services. When in-house support services are required, the Consultant will be compensated for hours on-the-job.

1. Potential in-house tasks

The following table lists some of the tasks that may be assigned to the Consultant as in-house support services. The table also indicates the type of position that would be expected to perform this task:

In-house task	**Position**
Fatal crash reviews	Engineer in training
Draw collision diagrams	Technician
Retrieve crash data	Technician
Draw existing condition diagram	Technician
Draw proposed condition diagram	Technician
Crash analysis	Engineer
Operational analysis	Engineer
Field reviews and field measurements	Technician / engineer in training / engineer
Others as needed	Depending on the task assigned

2. Related in-house support costs

If the proposed project involves the use of Department office space or equipment by consultants, the Department's policies provided as Attachments H and K, should be observed. Use of the Field Office for non-CEI type projects: For contract negotiation purposes, a field office rate (labor and expenses) shall be applied when full time (40hr/wk) Consultant staff is assigned in Department space for a minimum of six consecutive months.

3. Billing for in-house support services

The Consultant shall invoice the Department on a monthly basis for in-house support services, unless otherwise approved by the Department's project manager. The invoice must be preceded by a progress report which shall, at a minimum, identify the hours labored by the employee on a daily basis.

The Department's project manager will compare the days labored in the progress report with the "task tracking sheet" that in-house support employees will be asked to submit on a daily basis (the task tracking sheet identifies the tasks in which the employee worked during the day, and the time spent on each task). This task tracking sheet is to be submitted to the Department project manager via e-mail. The Department recommends that the employee also send a copy of such e-mail to his/her Consultant project manager.

Should there be a discrepancy between the task tracking sheets and the progress report, the

Department's project manager will reject the progress report and request that it be revised and resubmitted so that it is in full agreement with the task tracking sheets.

4. Evaluation of in-house support employees

Employees providing in-house support services for periods longer than 21 working days will be evaluated on a monthly basis by the Department's project manager. The basis for evaluation will be determined for each employee based on the nature of the task(s) assigned.

A copy of the evaluation will be provided to the employee and to the Consultant Project Manager.

C. Safety Study

The District Safety office is responsible for reducing crashes through the implementation of engineering countermeasures.

Therefore, the study's goal is to develop traffic operational strategies to enhance safety, while minimizing impact, if any, on traffic flow. As part of this assignment, the Consultant shall complete the following tasks consistent with the procedures and guidelines outlined in the FDOT MUTS Manual, FDOT Traffic Engineering Manual, MUTCD, HSIP, AASHTO and any other technical publications approved by the FDOT:

1. Collect data relevant to the study location, example:
    a. Crash data
    b. Hard copies of police reports
    c. High crash listing
    d. Aerial photographs
    e. Field inventory
    f. Lighting levels (if nighttime crashes are the object of the study)
    g. Other relevant data
2. Summarize the latest 3-year crash data or 5-year of crash data as needed by preparing crash summary tables
3. Review hard copies of critical crash types as needed and:
    a. Prepare collision diagrams
    b. Ensure that there are no discrepancies between the police reports, the crash data, and the summary tables
4. Identify significant crash patterns
5. Conduct AM and/or PM peak hour field reviews to assess the existing safety and operational conditions
6. Develop engineering countermeasures to reduce number of crashes and/or the severity of the crash patterns identified while attempting to minimize any negative impact on operations.
7. Present findings to the District Safety office.
8. Revise recommendations, if necessary, based on the input from the Department.
9. Assess the constructability of the proposed improvements
10. Prepare an existing condition sketch based on the MUTS Manual
11. When impacts on operations are unavoidable, conduct an operational analysis of the existing and proposed conditions. The operational analysis shall be made using the most recent version of a traffic analysis software package approved by the project

manager. The Consultant shall choose the software package based on the software's ability to analyze the situation under consideration.

12. Prepare a conceptual improvement drawing depicting proposed improvements
13. Coordinate with other sections of the department and other public agencies (ex., counties, municipalities, etc.) regarding the proposed improvements
14. Prepare a preliminary estimate of construction costs
15. Calculate the benefit to cost ratio of the proposed improvements
16. Prepare a technical memorandum to document the findings and recommendations of the study
17. Present revised findings and recommendations to the Safety Review Committee meeting (SRC)
18. Revise recommendations, if necessary, based on input from SRC meeting
19. Present for the second time the revised recommendations to the SRC, if needed

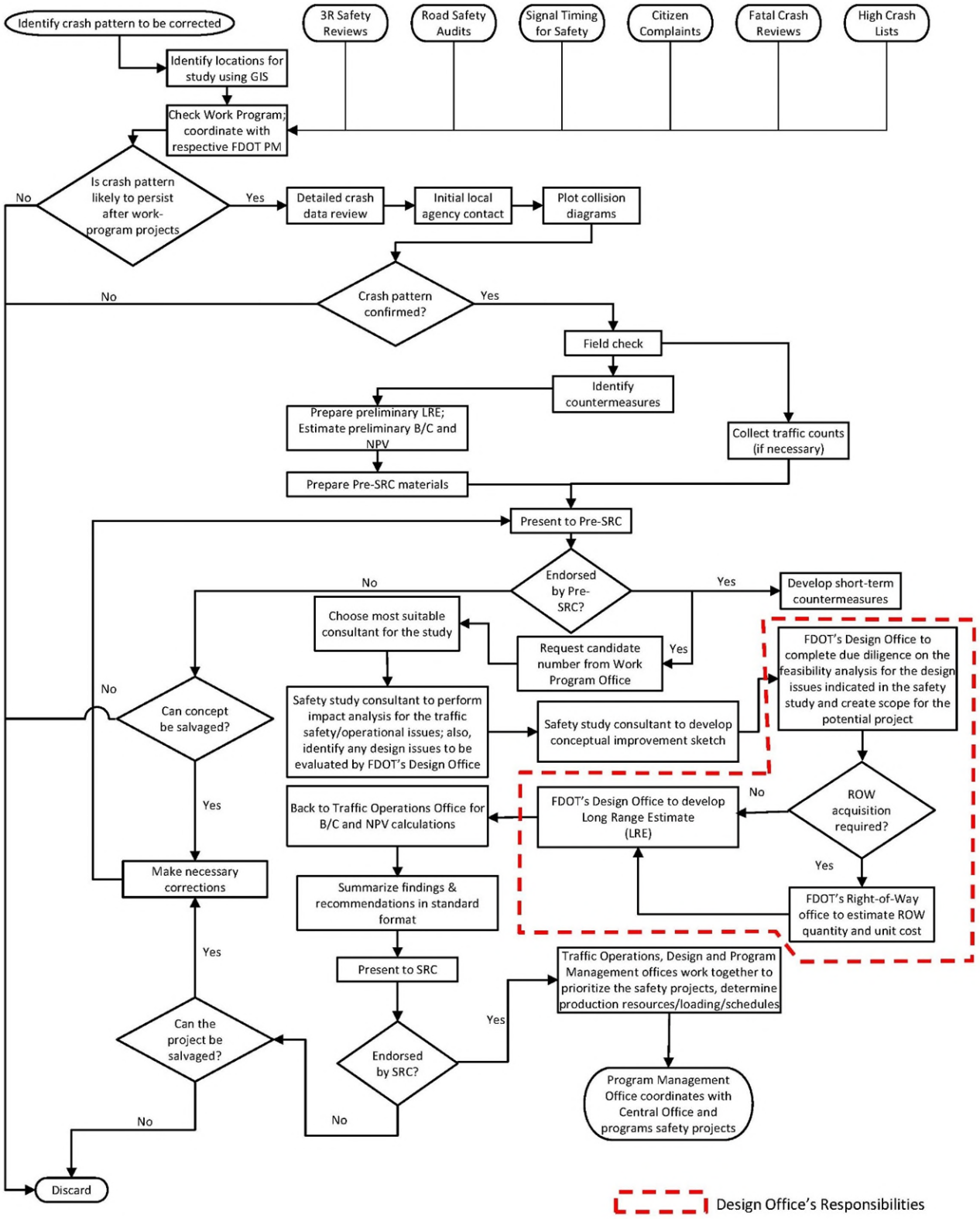
1. Safety Study – Development Process

The Department may develop Safety Studies by either:

1. Assigning all tasks (i.e., tasks 1-19) to the Consultant as a home-office task, or
2. Performing tasks 1-7 in house, and assign tasks 8-19 as a home-office task

The following flowchart provides a high-level overview of the process that the Department currently follows to develop safety studies. Please note that not all tasks are represented, and that the process may be further streamlined and optimized at any time.

Safety Study – Process Overview



District 4 Safety Study Process Flow Chart

2. Task product

Regardless of the development process selected, the Consultant shall submit to the Department a report that includes the following items:

1. Crash analysis
    a. Collision diagrams
    b. Crash summary sheets
2. Findings of crash analysis and field review
    a. Crash patterns to address
    b. Other safety concerns not supported by available crash data
3. Recommendations
    a. Recommendations to address crash patterns
    b. Crash reduction sheet
4. Operational analyses as needed
    a. Existing conditions
    b. Proposed conditions
5. Conceptual drawings
    a. Existing conditions
    b. Proposed conditions
6. Construction cost estimate
7. Benefit cost calculation
8. Net Present Value calculation

D. Structural Analysis

Typically, as part of retiming process, revisions to signal phasing may result in modifications to signal head configuration, thereby increasing the load due to additional signal heads. In such cases, the department may assign this task to the consultant to verify the structural integrity of the signal poles due to the additional loads. The consultant shall utilize FDOT approved analysis software packages (such as "Atlas" for strain poles and "Mast Arm Program" for mast arm supports) for conducting the structural analysis. If available, the department will provide access to as-built plans and/or survey files to the consultant. If such information is not available or if the study location is on a local roadway, the consultant shall be responsible for collecting pertinent data necessary to perform the structural analysis.

1. Task products

A structural analysis task will be deemed completed after a technical report, signed and sealed by a professional engineer registered in the State of Florida, has been submitted and approved by the department. The technical report at a minimum shall include:

- findings and recommendations
- calculations
- input and output data files of the computer model.
- one (1) Hard copy of structural analysis worksheets

The consultant shall submit two CD-ROMs (or DVDs) with PDF of the report and the files used to develop report in their native format (for example computer model files, word documents etc.).

E. Fatal Crash Review

The Department is responsible for reviewing each of the fatal crashes that occurs on the State Highway System and determining the actions, if any, that the Department could take to:

1. Reduce the probability that similar crashes will occur in the future
2. Reduce the severity of similar types of crashes

As part of this task, the Consultant will be provided copies of fatal crash reports to:

1. Identify the location of the fatal crash
2. Determine the adequacy of the road's:
    a. Geometric configuration
    b. Roadside elements
    c. Fixed objects
    d. Traffic control devices
        i. Pavement markings
        ii. signs
        iii. signals
    e. Lighting (if the crash occurred after sundown)
    f. Drainage
3. Review the crash history (three years) of the location to identify any crash patterns
4. Perform field reviews, when deemed necessary, and document findings
5. Determine the probable cause(s) of the crash
6. Perform Work Program review
7. Determine what actions, if any, the Department could take to:
    a. Reduce the probability that similar crashes will occur in the future
    b. Reduce the severity of similar type of crashes
8. Rank the recommended actions by their implement ability (ex., availability of right of way, etc.) and their impact on mobility.

1. Task products

Complete fatal crash disposition.

2. Performance time

Fatal crashes for which a disposition (disposition = cause of crash + recommended actions) can be made without the need for a field review shall be completed in no more than 45 minutes.

Fatal crashes for which a field review is needed to enter a disposition shall be completed in no more than 5 hours or a time-frame specified by the department project manager.

While the Department may assign fatal crash reviews as a task to in-house support staff, it may also assign it as a home-office assignment. Whenever fatal crash reviews are assigned as a home office assignment the hours involved shall be negotiated without exceeding the time limits specified above.

3. Format of submittals

- An acceptable disposition forms and related documents of submittal.
- CD-ROMs (or DVDs) with PDF of the disposition forms and related documents

F. Skid Hazard Reporting System Update

The Highway Safety Act of 1973 marked the first time that Congress specifically designated construction funds for highway safety improvements. The act directed the states to identify multiple safety hazards, slippery pavements among them.

The Department maintains a database of skid tests which have been performed along the State Highway System. The Department is responsible for reviewing this database and ensuring that slippery pavement problems are resolved in a timely manner. The Skid Hazard Reporting (SHR) system includes mechanisms for tracking slippery pavement conditions from detection through problem reduction.

Under this task, the Consultant shall update the SHR system by following the steps presented in the most recent update of the document titled "SKID HAZARD REPORTING System — User Documentation". Using the most current document applicable

G. Geographic Information Systems (GIS) Application Development

The Department relies on GIS as a tool to systematically identify locations with crash patterns that can be reduced or eliminated through the implementation of safety engineering countermeasures.

The Department has used its internal resources to develop a GIS tool that allows the Department to identify signalized intersections with specific crash patterns. For instance, the tool enables the Department to identify the signalized intersections that had the highest number of a certain subset of crashes. These subsets can be created based on a crash's:

1. Crash type (ex., rear end, angle, etc)
2. Harmful event (ex., failed to yield right of way, etc)
3. Type of injury (ex., none, severe, fatal, etc)
4. Hour of day (ex., 1:00am, 3:00pm, etc)
5. Day of week (ex., Monday, Wednesday, etc)
6. Month of year (ex., February, June, etc)
7. Distance from the intersection (etc, 100ft, 250ft, etc)
8. Pavement condition (ex., wet, dry, etc)

Under this task the Consultant will be expected to develop a GIS application that expands the capability of the Department's existing application. A sample of the GIS applications that the Consultant should be prepared to develop include:

1. Tool to rank non-signalized intersections based on the occurrence of a specific crash pattern (ex., angle crashes, left turn crashes, etc)
2. Tool to rank roadway segments based on the occurrence of a specific crash pattern (ex., run off the road, head on, etc.)
3. Tool to identify spots and/or roadway segments that meet certain conditions (these conditions could be related to the location crash history and/or geometric configuration), for instance;
    a. Identify non-signalized intersections with more than XX angle crashes in a YY year period (where XX and YY are variables)
    b. Identify signalized intersections with protected/permissive left turn phasing and with more than XX left turn crashes in a YY year period

c. Identify one (1) mile segments where the percentage of night time crashes is greater than YY % in the most recent year
d. Identify one (1) mile segments of undivided roads with more than XX head on and angle crashes in a 3-year period

The cost, deliverables and schedule for this task are to be negotiated prior to assignment of the Task Work Order. All GIS Deliverables must be built on the Department's ArcGIS Platform and adhere to the methods and practices outlined in the Transportation Technology Geographic Information Systems Manual

H. Net Present Value Driven Studies

Under this task the Consultant will be responsible for developing a safety study, from beginning (i.e., identification of study location) to end (i.e., approval by the SRC) that meets or exceeds a pre-established NPV target. The Consultant will be provided with guidance and criteria that needs to be followed and met. In this type of assignment, payment will be made based on percentage completed. The metric used to measure progress will be the NPV of the project(s) approved by the SRC, expressed as a percentage of the target NPV. If the NPV of the project(s) approved by the SRC exceeds the target NPV, payment will be capped at the pre-negotiated amount.

The Department project manager will, prior to the SRC meeting, review the project's NPV to ensure that the NPV methodology was properly applied; the correct crash reduction factors were used; the proper numbers and values per crash were used, etc. The Department project manager will have final say on the validity of an NPV calculation. No project shall be presented to the Safety Review Committee if the Department project manger does not support the Consultant's NPV calculation.

Before issuing this type of assignment, the Department will provide specific guidance and criteria for the Consultant to follow and meet. Typical guidance provided under this type of assignment includes:

1. Procedure to calculate NPV
2. Cost per crash information
3. Other information, as necessary

Typical criteria provided under this type of assignment includes:

1. The emphasis area (from the Florida Strategic Highway Safety Plan), or type(s) of crash (es) that the project must intend to reduce. For instance, the Consultant may be limited to developing a project that generates all NPV from reducing crashes that involve vulnerable users (i.e., pedestrians and bicyclists)
2. The geographical region where the project is to take place. For instance, the Consultant may be allowed to develop a project anywhere in the District, or it may be restricted to a certain County, City, etc.
3. The number of projects that may be developed to accumulate the target NPV. For instance, the Consultant may be directed to produce all the required NPV in one project alone, or it may be allowed to develop as many projects as necessary to reach the NPV target

4. The time that the Consultant will be provided to develop projects from beginning to end
5. Other criteria, as directed by the Department's project manager

Under this type of assignment, the Consultant must be aware that a project that is not approved by the SRC does not generate any NPV. Only SRC approved projects generate NPV that allow the Consultant to make progress towards meeting the target NPV.

I. Road Safety Audits

The District Safety office is responsible for the implementation of the FL-SHSP. The district believes that RSAs, because of their proactive nature and the low-cost/high value nature of their recommendations, are instrumental in addressing the emphasis areas of the FL-SHSP.

In general, RSAs aim to answer the following two questions:

1. What elements of the road may present a safety concern: to what extent, to which road users, and under what circumstances?
2. What opportunities exist to eliminate or mitigate identified safety concerns?

The goal of an RSA is to develop recommendations that enhance safety, while minimizing impact, if any, on traffic flow. As part of this assignment, the Consultant shall complete the following steps consistent with the procedures and guidelines outlined in the FDOT MUTS Manual, MUTCD, HSIP, AASHTO, and FHWA RSA guidelines:

1. **Identify project or existing road to be audited.**
2. **Select RSA team.** The consultant team must provide a qualified and multidisciplinary team of experts suitable for the specific RSA to be conducted – each RSA will likely require the participation of different areas of expertise. While in the ideal RSA some of the expertise is provided by the local agency and/or the Department, there may be occasions in which these agencies are unable to provide the necessary expertise. For these cases, the consultant team shall have access to experts within the necessary fields of expertise. Typical fields of expertise necessary to conduct an RSA are:
    a. Road safety specialist. The road safe specialist shall act as the leader of all RSAs. As the RSA team leader, the road safety specialist shall sign and seal the final RSA document – the road safety specialist shall be a licensed engineer in the State of Florida
    b. Traffic operations engineer
    c. Road design engineer
    d. Local contact person
    e. Other areas of expertise. Some of the areas of expertise that may be required in some RSAs may include (this is not intended to be a comprehensive list):
        i. Human factors
        ii. Maintenance
        iii. Enforcement
        iv. First response
        v. Pedestrian & bicycle treatment
        vi. Transit operations
        vii. ITS

3. **Conduct a pre-audit meeting to review project information.** This meeting shall bring together the project owner, the design team (if any) and the audit team to discuss the context and scope of the RSA and to review all project information available.
4. **Office review of crash data and other available information**. This step aims to help identify areas of safety concerns. The RSA team should restrict its comments to those issues having a bearing on the safety of road users. Comments may be either specific to a particular location or broad-based. Issues related to aesthetics, amenities, or congestion should also be commented upon if they lead to less-safe conditions
5. **Perform field reviews under various conditions.** For typical RSAs, at least 3 field reviews ought to be performed: one during night time, one during the daytime peak period, and one during day-time off-peak period. The number/time of field reviews may be modified if the RSA study location justifies it. The objectives of the field reviews are:
    a. Gain insight into the project or existing road
    b. Verify/identify areas of safety concerns
6. **Conduct audit analysis and prepare report findings.** As a result, the safety issues are identified and prioritized and suggestions are made for reducing the degree of safety risk. Suggestions to enhance safety are to be prioritized using a Cartesian plane where the X axis represents "feasibility", and the Y axis represents "value". RSA suggestions should be appropriate to the state in the RSA and the elements being examined (ex., the suggestions of a construction phase RSA would be different than those made in a preliminary design RSA). The RSA results are then succinctly summarized in the formal RSA report.
7. **Present audit findings to project owner, design team, RSA steering committee, or Safety Review Committee.** The audit team will orally report the key RSA findings to the project owner, design team, RSA steering committee, or Safety Review Committee in order to facilitate the understanding of the RSA.
8. **Record/Prepare Formal Response.** The consultant team will summarize the feedback provided by the project owner, design team, RSA steering committee, or the Safety Review Committee to each safety issue/recommendation listed in the RSA report.

The Consultant team shall also be prepared to conduct RSAs of any of the following types:

1. Pre-construction road safety audits
    a. Preliminary design road safety audits
    b. Detailed design road safety audits
2. Construction Road Safety Audits
    a. Pre-opening road safety audits
    b. Post-Construction Road Safety audits

RSAs of existing roads

The members of the RSA team shall have demonstrated excellent command of the MUTCD and familiarity with the Department's Local Agency Participation (LAP) program.

It is expected that many of the recommendations made on post-construction RSAs would involve pavement marking & signing enhancements. The consultant team shall have a

demonstrated ability and experience interpreting the MUTCD and creating pavement marking & signing plans.

It is also expected that, occasionally, RSAs may recommend relatively high-cost safety enhancements (ex., installing a new signal, installing/upgrading lighting, etc). Should an RSA take place on a non-State Road, it is also possible that the local agency having jurisdiction over the road may not have available the funds necessary to implement the recommendation. In these cases, the consultant will be required to explain to the local agency the Department's LAP program.

1. Task products

An RSA will be deemed completed after the following submittals are received and approved by the Department:

1. **RSA report.** In general, the RSA report shall follow the following sample outline:
    a. Introduction
        i. Scope and purpose of the RSA
        ii. Identification of project stage or existing road and items reviewed and not reviewed
        iii. Project limits
    b. Background
        i. Audit team, affiliation and qualifications of team members
        ii. Commentary on data received from project owner and design team
        iii. General observations regarding site visit
    c. Findings and suggestions
        i. List of safety issues
            1. Safety issue 1 – description of issue, evaluation of safety risk, suggestions
            2. Safety issue 2 – etc.
        ii. Prioritization of safety issues based on value and feasibility using Cartesian plane
    d. Formal statement. This is a concluding statement signed by the RSA team members indicating that they have participated in the RSA and agreed or reached consensus on its findings. The RSA team leader – the Road Safety Specialist – who is required to be a licensed engineer in the State of Florida, shall sign and seal the final report.
2. **Crash summary tables.** Each submission of the draft and the final technical memorandum shall be submitted with the supporting crash summary tables. The crash summary tables shall be developed using a spreadsheet compatible with MS-Office Excel 2007 and submitted to the Department in an electronic format.

2. Performance time

When a single Road Safety Audit is issued in a task work order, the Consultant shall be provided 15 calendar days to conduct the RSA, submit a first draft to the Department, and make the presentation of findings. The calendar days begin counting on the day the task work order is issued.

The Department will prioritize the RSAs whenever multiple ones are issued in the same task work order. The consultant, however, shall have enough qualified staff to simultaneously conduct up to two RSAs

3. Format of submittals

All submittals, drafts and final document, shall be submitted to the Department in the following manner, unless directed otherwise by the Department's project manager:

1. One (1) Hard copy (i.e., print), and
    a. Electronic formats, which are: pdf, and
    b. the documents' native format (ex., MS-Word, MS-Excel, etc).

J. Data Collection

Under this task the Consultant may be required to conduct, on a cost-unit basis, any of the following types of counts:

1. Automated Data Recorder (ADR) Counts

a) 24-hour (1 day) traffic count (15-minute intervals)

b) 48-hour (2 days) traffic counts (15-minute intervals)

c) 168-hour (7 days) traffic counts (15-minute intervals)

d) 336-hour (14 days) traffic counts (15-minute intervals)

2. Turning movement counts

a) 4-hour turning movement and/or pedestrian counts

b) 6-hour turning movement and/or pedestrian counts

c) 8-hour turning movement and/or pedestrian counts

Counts conducted by the Consultant shall be taken during the weekday period of Monday afternoon through Friday morning, with the exception of 7 and 14-day counts, unless approved in writting by the Department's project manager.

3. Pedestrian volume counts

4. Pedestrian group size studies

5. Vehicle gap size studies

6. Vehicle spot speed studies

7. Vehicle classification surveys

a) 24-hour vehicle classification counts (15-minute intervals)

b) 48-hour vehicle classification counts (15-minute intervals)

8. Quality control for data collection

The Consultant shall perform independent quality control of all data collected for the Department. At a minimum, the following quality controls shall be performed:

a) For ADT counts

The Consultant must ensure that:

- 24-hour directional split < 15%, and
- Peak hour directional split < 15%

If any of the directional splits exceeds the tolerance threshold, the Consultant must justify, in writing, potential reasons why the threshold was exceeded. If the Department does not deem such justification valid, the Consultant shall repeat the counts at its own cost. If however, the second count is consistent with the first (i.e., the threshold is exceeded, again), the Department will reimburse the Consultant for the second count.

b) For vehicle classification counts

The Consultant must ensure that:

- ·Vehicles assigned to unknown category < 10%

If the percentage of vehicles assigned to the unknown category exceeds 10%, the Consultant must justify, in writing, potential reasons why the threshold was exceeded. If the Department does not deem such justification valid, the Consultant shall repeat the counts at its own cost.

c) For turning movement counts

The Consultant must ensure that when volume A and volume B are compared, they do not differ by more than +/- 15% (i.e., the tolerance).

Volume A		Volume B		Tolerance (%)
Morning peak period	North bound left turn	Afternoon peak period	East bound right turn	15
Morning peak period	South bound left turn	Afternoon peak period	West bound right turn	15
Morning peak period	East bound left turn	Afternoon peak period	Southbound right turn	15
Morning peak period	West bound left turn	Afternoon peak period	North bound right turn	15
Afternoon peak period	North bound left turn	Morning peak period	East bound right turn	15
Afternoon peak period	South bound left turn	Morning peak period	West bound right turn	15
Afternoon peak period	East bound left turn	Morning peak period	Southbound right turn	15
Afternoon peak period	West bound left turn	Morning peak period	North bound right turn	15

In the table above, a peak period corresponds to the peak 60 minutes

9. Task products

The Consultant shall provide the following documentation at the time of submittal:

- A CD-ROM, or any other digital media approved by the Department's project manager, containing the collected data in the following formats:
  - PDF format, and
  - Spreadsheet format compatible with Microsoft Excel 2007
- ·Hard copy of collected data using survey processing software (SPS) 24-hour synopsis report.

- Electronic files provided to the department shall be named according to the following rule:

Rule:	Year-month-day-SectionNumber-milepost.extension
Example:	2009-01-25-86015000-002.063.pdf
Example description:	Count taken on January 25, 2009 in the intersection of SR 818 (Griffin Road) and Nob Hill Road / SW 100 Avenue

When such a rule does not allow the Consultant to provide a description of the location where the counts were taken (ex., counts taken on a state road without a section number, etc), the Consultant shall request a new naming convention/rule from the Department's project manager.

K. Qualitative Assessment

Review crash history to determine if a pattern(s) exist. Conduct an engineering field review to identify potentially correctable/hazardous conditions. Verify existing conditions. • Recommendations are either short-term or "ideas" that may require additional study and vetting. May lead to more study. • Considered high level.

1. Task Products

This task will be deemed completed after the following submittals are received and approved by the Department:

- Final Technical memorandum. Prior to submitting the final technical memorandum, the Consultant shall submit the document as a draft. If changes need to be made, the Department will request a modified draft. The final technical memorandum shall be submitted only after an acceptable draft, which generates no comments from the Department is submitted. It is expected that the number of drafts submitted to the Department will vary based on the quality of the submittal. The final technical memorandum shall contain the name and contact information of the Consultant's engineer who managed the task.
- Crash summary tables. Each submission of the draft and the final technical memorandum shall be submitted with the supporting crash summary tables. The crash summary tables shall be developed using a spreadsheet compatible with the most current MS-Office Excel submitted to the Department in an electronic format.

2. Performance Time

Schedule: Three to four weeks

L. Desktop Reviews

Review crash history to determine if a pattern(s) exist. Conduct a desktop review to identify potentially correctable/hazardous conditions. Review the existing conditions on available on-line resources such as Google Maps, Google Earth, FDOT's website, etc. • Recommendations are either short-term or "ideas" that may require additional study and vetting. May lead to more study. • Considered high level.

1. Task Products

This task will be deemed completed after the following submittals are received and approved by the Department:

- Final Technical memorandum. Prior to submitting the final technical memorandum, the Consultant shall submit the document as a draft. If changes need to be made, the Department will request a modified draft. The final technical memorandum shall be submitted only after an acceptable draft, which generates no comments from the Department is submitted. It is expected that the number of drafts submitted to the Department will vary based on the quality of the submittal. The final technical memorandum shall contain the name and contact information of the Consultant's engineer who managed the task.
- Crash summary tables. Each submission of the draft and the final technical memorandum shall be submitted with the supporting crash summary tables. The crash summary tables shall be developed using a spreadsheet compatible with the most current MS-Office Excel and submitted to the Department in an electronic format.

2. Performance Time

Schedule: Two to three weeks

M. Other Services

1. Public Outreach

The Consultant shall perform those services required for public information and involvement activities which may include, but are not limited to, the development and implementation of events, workshops, informational meetings, coordination, facilitate agency/stakeholder collaboration, audiovisual and visual aid preparations, video and slide presentation production, display and exhibit preparation, media conversion, printing services, and community involvement.

2. Field reviews

The Department receives complaints or requests from concerned citizens and local government agencies about safety concerns on the state highway network. A qualified traffic engineer from the Consultant firm shall conduct a field review of those locations to determine the extent of the problem and its recommended action. As part of this task, the Consultant shall fill out a check list that requires, at a minimum, the following information:

1. Roadway geometry
2. Driveways
3. Land use
4. Speed limits

5. Traffic queues (back-up)
6. Traffic conflicts (observed during field review)
7. Possible circulation patterns
8. Others

Relevant photographs (those that support an observation or are necessary to convey a point) shall be taken to graphically present the existing geometrical and operational conditions.

a) Task products

1. Summary of field review (date, time, reviewers, etc)
2. Completed check list
3. Photographs
4. Recommended action to address the concerns of citizens and/or local government agencies

3. Crash Analysis

As part of this task the Consultant shall review crash data for a minimum of the most recent 36-month period for which data is available. The review includes:

1. Preparing crash summary tables
2. Drawing collision diagrams

For the two products listed above, the Consultant shall use formats approved by the Department.

Based on the review of the crash data and collision diagrams, the Consultant shall identify significant crash patterns, if any, and develop appropriate countermeasures to enhance motorist safety and traffic flow. Recommended alternatives may include intelligent transportation system solutions.

a) Task products

1. Crash summary tables
2. Collision diagrams
3. Summary of crash data findings and recommendations

4. No-passing zone study

The Consultant shall conduct a no-passing zone study in accordance with Chapter XII of the MUTS Manual. In addition, the Consultant shall conduct a no-passing zone warrant analysis when applicable

a) Task products

1. No-passing zone requirements
2. No-passing zone warrant analysis, if applicable

5. Lighting

As part of this task, the Consultant will investigate the adequacy, from a safety standpoint, of the existing lighting system(s) and determine the need for the installation of either install a new lighting system, add lights to the existing system, or upgrade the luminaries of the existing lighting system. The Consultant will choose a lighting study technique (such as AASHTO criteria, NCHRP Report: Warrant for Highway Lighting, NCHRP Guidelines for Roadway

Lighting Based on Safety Benefits and Costs, light meter, etc) and shall get the Department project manager's approval of the study method before conducting the study.

The goal of this type of assignment is to cost-effectively develop lighting projects that help reduce the potential for nighttime crashes involving vehicles and vulnerable users

a) Task products

1. Lighting analysis worksheets
2. Highway lighting study report

b) Highway lighting justification

As part of this task the Consultant shall develop a Highway Lighting Justification Report to analyze and justify the need for a roadway lighting system. The Study shall be developed according to the guidelines provided in the Manual of Uniform Traffic Studies.

c) Illuminance measurement

As part of this task the Consultant shall perform night time field reviews and take spot illuminance measurements at specific locations specified by the department project manager. The Consultant shall document the field review and the results.

6. Spot speed study

As part of this study task, the Consultant shall conduct a spot speed study in accordance with the procedure outlined in the Manual of Uniform Traffic Studies, Chapter XIII. The Consultant shall obtain the speed data by means of a radar gun, a directional relay device, or other method as directed by the Department project manager. The study shall include a minimum sample of 100 vehicles for each direction of travel. The Consultant will present these data on a department's approved form.

a) Task products

1. Field data sheets
2. Summary of speed data including 85th percentile speed, average speed, speed variance, and 10mph pace

7. Safe curve speed study

As part of this task, the Consultant shall conduct a safe curve speed study in accordance with the MUTS Manual, Chapter XI. The purpose of this study is to determine the maximum speed to safely negotiate a given curve and the need for installing maximum speed advisory signs. The Consultant shall record and summarize the data in a form, or format approved by the Department project manager.

a) Task products

1. Report summarizing findings and the recommended advisory speed for the curve
2. Field data worksheet

8. Conflict analysis

This study is to be conducted in accordance with the Federal Highway Administration (USDOT) Course "Traffic conflict technique for safety and operations" (publication FHWA-HI-90-023, NHI Course 38059). As part of this study, the Consultant shall observe and record all conflicts and their frequencies in the field. Field observations are to include any erratic maneuvers, near misses, converging/diverging conflict patterns, etc. The analysis shall be both quantitative and qualitative. Due to the subjective nature of this type of analysis, the Consultant shall make

efforts to ensure the use of highly qualified traffic engineers with practical/operational experience for all conflict observations. Based on the conflict analysis, the Consultant shall make recommendations for engineering improvements, as appropriate.

a) Task products

1. Summary of conflict analysis study
2. Field data worksheets

9. Fixed object inventory

The purpose of this task is to inventory locations on State Highway System where fixed object exist within the roadway clear zone. Typical fixed objects are utility poles, signals poles, sign posts, etc. The Consultant will identify the fixed object locations and make recommendations for mitigating the same so that the hazard can be removed, relocated, delineated or made crash-worthy.

In addition, the Consultant will make determination of the need for guardrail or cable-barrier to protect the motorists against hazards such as steep embankment on the side of the median, body of water adjacent to the roadway, etc. While the guardrail may be required at a location, other alternatives, if appropriate, should be investigated and evaluated.

a) Task products

1. Inventory of fixed objects and recommended action
2. Evaluation of the need for guardrail

10. Railroad crossing preemption study

The purpose of this study is to investigate the need, and make recommendation, for signal pre-emption features for intersections located within a certain distance (ex., 500 feet) from a railroad/highway crossing. The Consultant shall:

1. verify if vehicle queues extend up to, or beyond the tracks,
2. estimate queue lengths utilizing adequate simulation software(s), and
3. verify the results by making observations in the field

The study should be conducted in accordance with the MUTCD and the Department's guidelines outlined in Topic No. 750-020-010-a.

a) Task product

1. Railroad/highway crossing pre-emption study report

11. Sight distance study

Under this task, the Consultant shall determine the required sight distance at a given location and evaluate the adequacy of the existing sight distance. Furthermore, the Consultant shall make recommendations for improving the sight distance at such a location, as appropriate. This study should be conducted in accordance with the MUTCD and AASHTO's Green Book (A policy of Geometric Design of Highways and Streets). The study results shall be in compliance with the latest edition of the State of Florida Roadway and Traffic Design Standards

a) Task products

1. Determination of required sight distance
2. Documentation of existing sight distance
3. Recommendation for improving sight distance, when appropriate

12. Signal warrant analysis

The Consultant shall analyze the collected data in light of the warranting conditions for the eight (8) warrants described in the MUTCD, the Department's MUTS Manual, and accepted traffic engineering practices in the District. From this analysis, a recommendation shall be formulated as to whether or not a traffic signal should be installed. The recommendation and the basis for it shall be documented in a summary report. A completed analysis form, the traffic counts, photographs, and the delay analysis shall be attached to the signal warrant analysis report.

The Consultant must be aware that engineering judgment must be exercised in making the final recommendation to install or not a traffic signal. Engineering judgment must be exercised to taken into account factors such as the spacing of adjacent signals, the impact of the new signal on arterial operation, availability of acceptable gaps in the mainline traffic, etc. Alternatives to signal installation must also be considered.

a) Task product

1. Operational analysis worksheets for existing conditions; and proposed conditions
2. Summary of operational analysis results
3. Left turn phasing analysis as applicable

13. Operational analysis for intersections

The Consultant shall determine the existing and proposed LOS utilizing the methodology outlined for arterials in the 2000 Highway Capacity Manual. The analysis shall also indicate LOS analysis for the individual intersections within the segments under study. The Consultant shall utilize at least one of the following software packages for the analysis: SYNCHRO, Signal 2000, HCS. The Consultant may also be required, when directed by the Department project manager, to utilize CORSIM software to evaluate the existing and proposed conditions. The output of the analysis shall be presented in a tabular format comparing LOS, delays, V/C ratios and queue lengths for existing and proposed conditions.

a) Task products

1. Operational analysis worksheets for existing conditions; and proposed conditions
2. Summary of operational analysis results
3. Left turn phasing analysis as applicable

14. Operational analysis for arterials and networks

The Consultant shall determine the existing and proposed LOS utilizing the methodology outlined for arterials in the 2000 Highway Capacity Manual. The analysis shall also indicate LOS analysis for the individual intersections within the segments under study. The Consultant shall utilize at least one of the following software packages for the analysis: SYNCHRO, Signal 2000, HCS. The Consultant may also be required, when directed by the Department project manager, to utilize CORSIM software to evaluate the existing and proposed conditions. The output of the analysis shall be presented in a tabular format comparing LOS, delays, V/C ratios and queue lengths for existing and proposed conditions.

a) Task products

1. Operational analysis worksheets for existing and proposed conditions
2. Summary of operational analysis results and recommendations

15. Miscellaneous services

Any items or tasks that are not outlined in the above study types would be considered additional services and would be provided as requested and authorized by the Department. The fee for any of these services will be negotiated separately but will be at the hourly wages agreed to in the contract. Additional services may include but are not limited to the following items:

1. Obtain aerial photography
2. Review plans for roadway projects

Any study which does not fit the above predefined study types shall be negotiated between the Department's project manager and the Consultant, in accordance with the job class rates agreed to in the contract.