EXHIBIT A

SCOPE OF SERVICES
District-Wide Traffic Operations/Studies Consultant

Stage III

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SCOPE OF SERVICES

District-Wide Traffic Operations / Studies Consultant

OBJECTIVE

The general purpose of this consultant contract is to provide the Department with professional traffic engineering services through the development of various traffic operations and safety studies that will be identified for intersections, arterials, etc., and related improvement recommendations and evaluations.

All reports/studies are to be signed and sealed by a professional engineer registered in Florida whose area of specialty is traffic engineering. The Department must approve the studies to fulfill the requirements of the contract. As part of this approval process, a preliminary or draft report is to be submitted for Department review before submitting the final signed and sealed document. The Department's Project Manager will determine the submittal dates for the draft and final reports.

Authorization to perform the required services shall be conveyed to the Consultant through a **Task Work Order for Professional Services (TWO)** issued by the Department's Project Manager. The Task Work Order specify the limits of the study area, the desired task activities to be performed, the estimated completion date, the products to be submitted to the Department, and the total price to be paid to the Consultant for services rendered and approved. Each Task Work Order issued by the Department's Project Manager shall serve as the formal authorization, effective the date of the Letter of Authorization or a subsequent date if so specified.

SERVICES

The Consultant shall provide engineering services to satisfy the Department's stated contract objectives as further described in the following overall service types and tasks.

PROJECT MANAGEMENT

This service type includes management activities conducted by the Consultant to ensure the satisfactory completion of the contract requirements. Project management is a continuous service rendered throughout the duration of the contract and includes scheduling, monitoring, documenting and reporting activities. These activities will be used to assist in the Department's review of the Consultant's conformance to the scope of services. For this contract, project management will be divided into three (3) areas; 1) schedule/status reports, 2) meetings and 3) project records/files. This service will be paid as part of the individual TWO.

SCHEDULE/STATUS REPORTS

The Consultant shall submit, when requested by the Department's project manager, a project schedule for each study location within one week after receiving the "**Task Work Order"** This project schedule will address the establishment of time frames for completing the applicable task activities outlined in the Task Work Order. The Consultant shall also meet with the project manager monthly or prepare monthly status reports of the Contract's progress as directed by the Department's project manager. This status report shall include, but not be limited to, a discussion of technical/contract administration problems encountered and resolved, updates to and variations from the project schedule(s), and a current comparison of contract expenditures by task activity to include anticipated and actual billing costs to the Department for work satisfactorily completed. Two (2) copies of the monthly status report shall be delivered to the Department by the tenth day of the following month.

The Department shall provide prompt review and comments of the monthly status report as needed, and provide guidance in the resolution of any problems or schedule variation.

Products

I) Project schedules with updates
II) Monthly status reports

MEETINGS

Periodic meetings, no less than every other month, relating to the performance of contract services and tasks, will be necessary throughout the duration of the contract. The Consultant shall prepare minutes of each meeting to include "action" items developed and/or assigned. These minutes shall be distributed to all attendees within one week after the meeting.

Product

I) Meeting minutes

CONTRACT RECORDS AND FILES

The Consultant shall maintain the records and files for the work required in this contract. The records and files shall contain all correspondence to and from the Consultant related to the completion of work. This also includes any other materials, traffic data, or information that the Consultant has obtained or has been sent/ given to the Consultant. The records and files shall include all TWO completed to date and shall be delivered to the Department every four months. This submittal shall include each TWO in PDF format, condition diagram in CADD format, and crash data in excel format.

The Department shall forward to the Consultant copies of all correspondence, materials, traffic data and other information received/directed to others if related to the work in this contract and appropriate for the contract files.

Product

I) Contract records and files

SERVICE TYPES 1 thru 11 - Development of Traffic Operations and Safety Studies Reports

This service area will include the development of the five (5) basic types of safety and traffic operations studies plus composite studies, miscellaneous, and public involvement:

I) Qualitative Assessments (service type 1)
II) Signal Warrant Analysis (service type 2)
III) Intersection Analysis (service type 3)
IV) Arterial Analysis (service type 4)
V) Left Turn Phase Warrant Analysis (service type 5)
VI) Composite Studies (service type 6)
VII) Other traffic engineering related studies (service type 7)
VIII) Public Involvement (service type 8)
IX) Fatal Crash Reviews (service type 9)
X) Speed Zone Studies (service type 10)
XI) Technical Memo (service type 11)

Each of these studies is to involve the performance of discrete work tasks and subtasks by a qualified traffic engineer. Additional or supplemental tasks as determined by the Department's Project Manager might also be required.

All reports shall be signed and sealed by a professional engineer registered in Florida. The following discussion of the study types with associated work tasks is provided.

SERVICE TYPE 1 - QUALITATIVE ASSESSMENT

Task 1A - Qualitative Assessment - (Intersection)

A qualified traffic engineer of the firm, experienced in the traffic engineering discipline, and registered in the state of Florida (PTOE Certified Preferred) shall visit the location under study during the morning and evening peak traffic periods or other period as specified by the Department's project manager (crash peak), to make qualitative assessments of the intersection operation. Such factors as queue lengths, delays, vehicular conflicts or any other operational characteristics critical to evaluate the need for intersection improvements, signal control, and

left turn phase, etc. shall be noted. During the field review safety conditions must also be observed and recorded.

The Consultant shall also examine the physical features to document evidence of high-crash conditions and observe traffic movements for high -risk maneuvers. In addition, the Consultant will review geometries and traffic control devices for deficiencies related to abnormal crash patterns, and identify potential driver expectancy problems. The Consultant will complete a standard Field Observation Report form or equivalent form approved by the Project Manager.

Photographs shall be taken of all intersection approaches with emphasis on obtaining visual information that would be of value to the Department during any subsequent project plan preparation activities. For example, utility conflicts, right of way constraints, obstructions, unusual geometries, deficient pavement conditions or markings, etc. should be photographed and/or otherwise detailed as appropriate. Photos and/or detailed graphics (CADD format) shall be included in the conceptual recommendation report.

The Consultant shall collect hourly traffic count data on each approach to the intersection for a minimum period of 72 hours during typical weekday traffic conditions or as otherwise specified. Traffic count data should be recorded by automatic traffic recorders (ATR) furnished by the Consultant. In addition, the Consultant shall collect fifteen-minute peak-hour turning movement counts (two hours in the morning and two hours in the afternoon or other peak periods during which warranting volumes might exist) and pedestrian volume shall be taken for a total of four (4) hours encompassing the morning and afternoon peak periods and representative off-peak periods as needed. The consultant shall review the traffic count data and the results of this qualitative assessment shall be incorporated in an official recording of field review minutes.

The Consultant must also review a minimum of three years of crash history of the intersection. This review includes the preparation of crash summary sheets and collision diagrams. The crash summary shall at a minimum include the classification of crashes by type, time of day, day of the week, and month. Injury severity must also be documented in the summary as well as weather and lighting conditions under which the crash occurred. Consultant shall calculate the safety ratio and confidence level for the spot under study and thus determine if the location is a high crash location.

Finally, the consultant shall also recommend to the Department the need for any improvements and/or further study if necessary.

Task 1A Products

I) Assessment of intersection safety and operation in report form (Three draft copies and three final copies signed and sealed)
II) 72 hour approach volume counts
III) Four-hour turning movement counts/with pedestrian volume

IV) Recommendations for improvements and/or further study if necessary
V) Crash summary review (include crash summary sheets & collision diagrams)
VI) PDF format report on a CD

Task 1B - Qualitative Assessment - (Arterial)

The Qualitative Assessment (Arterial) analysis will be conducted along a study section that for the purpose of this contract is assumed for an urban section to be one mile in length with 4 signals or less, or a two (2) mile rural section with not more than two signals. A qualified traffic engineer of the firm, experienced in the traffic engineering discipline, and registered in the state of Florida (PTOE Certified Preferred), shall visit the arterial under study during the morning and evening peak traffic period, or other period as specified by the Department's Project Manager, in order to make qualitative assessments of arterial operation, particularly in terms of queue lengths, delays, travel speeds, high crash segments, high crash spots, access, conflicts or any other operational characteristics that should be considered in evaluating the need for safety or operational improvements.

The Consultant must also review a minimum of three years of crash history of the arterial. This review includes the preparation of crash summary sheets. The crash summary shall at a minimum include the classification of crashes by type, time of day, day of the week, and month. Injury severity must also be documented in the summary as well as weather and lighting conditions under which the crash occurred. Consultant shall calculate the safety ratio and confidence level for the spots within the study area and for the segment and thus determine if spots/segment is high crash locations.

The Consultant shall also evaluate the arterial's conformance to current access management criteria. The evaluation shall include an assessment of the nonconforming locations that may be affecting safety and/or level of service. It should also include any recommendations to rectify the nonconformance if warranted.

The Consultant shall perform standard travel time and delay studies along the subject arterial using the manual method or the computerized. Both of which are demonstrated in the Manual on Uniform Traffic Studies (MUTS). The Department's Project Manager must approve other state-of-the-art techniques.

Travel time and delay studies shall be conducted in each direction of travel during the morning and evening peak traffic periods and also during a daytime off-peak period. A minimum of six (6) runs shall be made for each direction and time period. From the travel time and delay data, a speed profile shall be developed for each condition. The profiles shall be supplemented with a written analysis of the location and determination of possible causes of the measured delays and constrained

running speeds.

Photographs shall be taken of any geometric, traffic or traffic control aspect about which the Department's Project Manager should be aware. The Consultant shall recommend to the Department the need for any improvements and/or further study if necessary.

Task 1B Products

I) Assessment of the arterial safety and operation (Three draft copies and three final copies signed and sealed)
II) Travel time and delay profiles
III) Travel time and delay analysis
IV) Summarized data & most prominent delay location
V) Crash summary review (include crash summary sheets)
VI) Recommendation for improvements and/or further study if necessary
VII) PDF format report on a CD

SERVICE TYPE 2 - SIGNAL WARRANT ANALYSIS

Task 2A - Signal Warrant Analysis

The Signal Warrant Analysis is the study used to evaluate a candidate location for possible signalization or signal removal. The Manual of Uniform Traffic Control Devices (2009, MUTCD) lists nine (9) minimum warrants that are to be evaluated as appropriate for the location. As an absolute minimum, the Signal Warrant Analysis will include the following activities.

Subtask 2A (a) Intersection Inventory

The Consultant shall conduct a field inventory of each intersection under study and prepare a detailed condition diagram on standard Department form contained in the MUTS or in another format approved by the Department. Condition diagrams should be created using CADD (DGN format) and shall include intersection geometry, lane use/arrangements, and identification of all traffic control devices including pedestrian features, and other roadway or roadside elements that contribute to the quality of intersection operation or safety such as bus stops, school zones, sight distance obstructions, etc. within 300 feet. It shall also include any roadway features, which may be impacted by signal installation or proposed alternatives.

Subtask 2A (a) Product

i) Condition diagram

Subtask 2A (b) Crash Analysis

The consultant shall analyze the crash data, collision diagrams and identify abnormal crash characteristics or patterns. The Consultant will develop a list of possible causes and countermeasures for each abnormal crash pattern. These causes must be site specific, identified during field review of the location under study. The Consultant's engineer will quantify the abnormal crash history whenever possible using scientifically based methods such as expected value analysis, safety ratio, confidence level, statewide crash rates, or other statistical method.

Subtask 2A (b) Products

i) Crash analysis (include crash summary sheets & collision diagrams0)
ii) Abnormal crash characteristics/patterns
iii) Possible crash causes and countermeasures for each abnormal pattern

Subtask 2A (c) Warrant Analysis/Recommendations in Report Format

The analysis of the collected data and the evaluation of the applicable warrants described in the MUTCD, and the Department's Manual of Uniform Traffic Studies (MUTS) shall form the basis for the report. From the analysis and in consideration of accepted traffic engineering practice, the Consultant shall formulate a recommendation as to whether or not a signal is warranted and justified and should be considered for installation or removal.

(Special Note: It is expected that engineering judgment will be exercised in making final recommendations for installation of a traffic signal. Consideration should be given to such factors as spacing of adjacent signals, impact of the new signal on arterial operation, acceptable gaps in the mainline traffic, etc. Alternatives to signal installation should also be considered). Also if applicable include other recommendations such as pavement markings, signage, channelization, etc. Attached to this report, in the form of appendices or figures (as appropriate), shall be the completed Departmental Warrant Analysis forms, Condition Diagrams, Collision Diagrams, and other products of Subtasks as described above.

Subtask 2A (c) Products

i) Three (3) draft copies and three (3) final copies signed and sealed of signal warrant analysis report
ii) Technician worksheets
iii) PDF format report on a CD

SERVICE TYPE 3 - INTERSECTION ANALYSIS

Task 3A - Intersection Safety and Operational Analysis

The Intersection Analysis is the tool by which an intersection is evaluated, after observation and data analysis, to determine the need as well as

opportunity for safety and operational improvements. For the purposes of contract negotiations, all intersection analyses shall be assumed to be performed at intersections under signal control. The Consultant is expected to consider intersection geometry, channelization, signal timing and phasing, display and operations, crash history, and delays as well as any other factors that impact the safety and operation of the intersection. Recommendations for improvement shall be evaluated for their effectiveness. A minimum of three (3) alternatives will be evaluated. The "Do Nothing" alternative may be included but not counted as one of the three alternatives. As a minimum, an Intersection Analysis will include the following activities.

Subtask 3A (a) Intersection Inventory

The Consultant shall conduct a field inventory of each intersection under study and prepare a detailed condition diagram on standard Department form contained in the MUTS or in another format approved by the Department. Condition diagrams should be created using CADD (DGN format) and shall include intersection geometry, lane use/arrangements, and identification of all traffic control devices including pedestrian features, and other roadway or roadside elements that contribute to the quality of intersection operation or safety such as bus stops, school zones, sight distance obstructions, etc. within 300 feet. It shall also include any roadway features, which may be impacted by an alternative.

Subtask 3A (a) Product

i) Condition diagram

Subtask 3A (b) Crash Analysis

The consultant shall analyze the crash data, collision diagrams and identify abnormal crash characteristics or patterns. The Consultant will develop a list of possible causes and countermeasures for each abnormal crash pattern. These causes must be site specific, identified during field review of the location under study. The Consultant's engineer will quantify the abnormal crash history whenever possible using scientifically based methods such as expected value analysis, safety ratio, confidence level, statewide crash rates, or other statistical method.

Subtask 3A (b) Products

i) Collision Diagrams
ii) Crash analysis (include crash summary sheets)
iii) Abnormal crash characteristics/patterns
iv) Possible crash causes and countermeasures for each abnormal pattern

Subtask 3A (c) Intersection Delay Study

An Intersection Delay Study shall be made for a total of four (4) hours encompassing the morning and evening peak traffic periods or other period as specified by the Department's Project Manager. This is to be collected for two (2) approaches (one lane group/one movement per approach) and collected simultaneously with the turning movement counts. This study shall be performed in accordance with the MUTS or other method approved by the Department's Project Manager. The study will provide some basic measures of delays, such as the average vehicle delay, presently existing at the intersection. This will cover both signalized and un-signalized intersections.

Subtask 3A (c) Products

i) Intersection delay study
ii) Technician's worksheets

Subtask 3A (d) Level of Service Analysis

Using methodology based on the 2010 HIGHWAY CAPACITY MANUAL (HCM 2010), the Consultant shall determine the existing and resulting level of service (LOS) for the existing and proposed alternatives or as directed by the Department. Level of service results obtained from running available software (HCS, SIGNAL 2000, etc) must be calibrated using field measured data such as delay or saturation flow rate. In some cases, as determined by Department's Project Manager, traffic simulation through the use of the CORSIM model may be required. This task will be negotiated separately.

An operational analysis will be used for critical intersection(s); the appropriate analysis as authorized by the Department's Project Manager will be utilized.

Subtask 3A (d) Products

i) Level of service for existing condition
ii) Level of service for optimized existing conditions
iii) Level of service of proposed conditions
iv) Summary of proposed recommendations

Subtask 3A (e) Recommendations for Improvements

From the results of the previous tasks, appropriate analysis, and any supplemental work tasks authorized by the Department's Project Manager, the Consultant shall make conceptual recommendations for optimizing the intersection operation - from both a safety and operational standpoint. The Consultant shall provide sketches, created in CADD (DGN format) with detailed measurements as appropriate, of existing conditions

as well as proposed conditions for the improvement alternatives identified. All proposed intersection improvements should be evaluated for their overall and peak period effectiveness. The Consultant shall describe the expected number and type of crashes & vehicular delays reduced by each improvement. As part of this effort the consultant shall evaluate the design criteria, design variances/exceptions, constructability and impacts (right of Way, drainage, permits, utilities, environmental, access management, American with Disabilities Act, etc.) of the alternatives.

Subtask 3A (e) Products

i) Proposed improvement sketches
ii) Analysis of effectiveness for each Improvement

Subtask 3A (f) Development of Preliminary Cost Estimates, Project Benefits

The Consultant shall determine a preliminary cost estimate (which will include PE, CEI and contingencies; also R/W if available) of the improvement alternatives proposed using recent Department historical cost data or other method as approved by the Department's Project Manager. The cost estimate shall make a distinction between the cost of the safety and operational improvements separately, so that safety and operational benefits can be clearly identified. Therefore, separate cost estimates for operational and safety improvements shall be submitted. The Consultant shall also determine the project/user safety and operational benefits resulting from implementation of the improvements identified. Project/user benefits will include such items as crash reduction, reduction in number of stops and delays and savings in fuel consumption. Nationally recognized references (such as those published by U.S.D.O.T.) shall be used to ascertain these benefits with the approval from the Department's Project Manager. The Consultant shall develop a safety benefit/cost ratio, an operational benefit/cost ratio and a total benefit/cost ratio for each of the proposed alternatives.

Subtask 3A (f) Products

i) Cost estimates for proposed improvements
    - Safety
    - Operational
ii) Benefit/cost ratios
    - Safety
    - Operational
    - Total

Subtask 3A (g) Report

The products of previous subtasks within this study shall be analyzed collectively. The consultant shall then form an Intersection Analysis report. The report shall recommend, in consideration of accepted traffic engineering practice and optimal project/user benefits, intersection

improvements to include but not be limited to geometry and/or capacity enhancements, improved channelization and positive guidance, improved signal operations, which may include display adjustments or phasing and timing adjustments, and reduced fixed object and sight distance hazards. Attached to this report, in the form of appendices or figures (as appropriate), shall be the products of subtasks described above.

Subtask 3A (g) Products

i) Three (3) draft copies and three (3) final copies signed and sealed of intersection analysis report.
ii) PDF format report on a CD

SERVICE TYPE 4 - ARTERIAL ANALYSIS

Task 4A - Arterial Safety and Operational Analysis

The Arterial Analysis will be conducted along a study section that for the purpose of this contract is assumed for an urban section to be one mile in length with 4 signals or less, or a two (2) mile rural section with not more than two signals. The analysis will form the basis for recommended improvements intended to control access, reduce travel time, delays and queues, enhance safety, manage and/or reduce conflicts, enhance positive guidance, and improve overall operational and traffic flow characteristics. A minimum of three (3) alternatives will be evaluated. The do nothing alternative may be included but not counted as one of the three alternatives. As a minimum, an Arterial Analysis will include these subtask activities:

Subtask 4A (a) Traffic Counts

The Consultant shall collect hourly 72 hours approach counts on all approaches at one intersection within the study limits during typical weekday traffic conditions or as otherwise specified. In addition, the Consultant shall collect four (4) hours of fifteen-minute peak-hour turning movement counts (two hours in the morning and two hours in the afternoon or other peak periods during which such volumes might exist) and pedestrian volume shall be taken for a total of four (4) hours encompassing the morning and afternoon peak periods and representative off-peak periods as needed. The Department's Project Manager may supplement the traffic data collection at additional intersections within the study limits

Subtask 4A (a) Products

i) 72-hour approach volume counts
ii) Four-hour turning movement counts/with pedestrian counts

Subtask 4A (b) Arterial Inventory

The Consultant shall conduct a field inventory of the arterial portion under study and prepare a detailed condition diagram on standard Department form contained in the MUTS or in another format approved by the Department. Condition diagrams should be created using CADD (DGN format) and shall include intersection geometry, lane use/arrangement, and identification of all traffic control devices including pedestrian features, and other roadway or roadside elements that contribute to the quality of intersection operation or safety such as bus stops, school zones within 300 feet, sight distance obstructions, etc. The inventory will also include a summary of phasing, splits, offsets, etc. for each signal. Intersections not in conformance with MUTCD or Departmental standards shall be identified detailing the nonconforming condition. For each signalized intersection within the study area, the distance in all directions to the next signalized intersection shall be measured and recorded to the nearest hundredth of a mile.

Subtask 4A (b) Products

i) Condition diagram
ii) Supplemental inventory information

Subtask 4A (c) Crash Analysis

The consultant shall analyze the crash data, collision diagrams and identify abnormal crash characteristics or patterns. The Consultant will develop a list of possible causes and countermeasures for each abnormal crash pattern. These causes must be site specific, identified during field review of the location under study. The Consultant's engineer will quantify the abnormal crash history whenever possible using scientifically based methods such as expected value analysis, safety ratio, confidence level, statewide crash rates, or other statistical method.

Subtask 4A (c) Products

i) Crash analysis (include crash summary sheets & collision diagrams)
ii) Abnormal crash characteristics/patterns
iii) Possible crash causes and countermeasures for each abnormal pattern

Subtask 4A (d) Arterial Analysis/Signal Optimization

Using methodology based on the 2010 HIGHWAY CAPACITY MANUAL (HCM 2010), the Consultant shall determine the roadway's existing and proposed level of service (LOS) for the existing conditions and for each of the proposed alternatives. An operational analysis will be used for the arterial(s). For urban and suburban streets with signal spacing less than two miles, the methodology outlined in *chapter 16* of the 2010 HIGHWAY

CAPACITY MANUAL (HCM 2010) shall be used. For two-lane and multilane highways, the methodologies outlined in *chapter 14 or 15* (whichever is applicable) of the 2010 HIGHWAY CAPACITY MANUAL (HCM 2010) shall be used.

This analysis shall also include LOS analysis for the individual intersections within the arterial under study, (*chapters 18 and 19 of the HIGHWAY CAPACITY MANUAL (HCM 2010) for signalized and un-signalized intersections, respectively)*.

The consultant may also be required, when requested by the Department's project manager, to use the CORSIM model to evaluate the existing and proposed alternatives, (this task will be negotiated separately). The Consultant may also be required to use Transyt 7F or Synchro for signal system optimization; or in the case of a diamond interchange, PASSER III. The consultant shall analyze various traffic signal control alternatives and determine the optimal strategy using the measure of effectiveness produced by the program as a guide. Controller type, phasing, cycle length, and splits shall be determined for two periods of the day. In developing the optimum control parameters, the Consultant shall take into consideration the Metro-Dade or Monroe County system requirements (i.e. cycle length, minimum greens, etc). Optimization of the signal operation shall be evaluated for each candidate geometric modification and each potential combination of modifications.

Subtask 4A (d) Products

i) Level of service for existing condition, optimized existing conditions, and proposed alternatives (Arterial and individual intersections)
ii) Summary of proposed recommendations
iii) Optimal signal control parameters
iv) Revised controller timing sheets
v) CORSIM input and output files (When requested by the Department's project manager)

Subtask 4A (e) Recommendations for Improvements

From the results of the previous tasks, appropriate analysis, and any supplemental work tasks authorized by the Department's Project Manager, the Consultant shall make conceptual recommendations for optimizing the operation of the arterial, from both a safety and operational standpoint. The Consultant shall provide sketches, created in CADD (DGN format) with detailed measurements as appropriate, of existing conditions as well as proposed conditions for the improvement alternatives identified. The Consultant shall describe the expected number and type of crashes and vehicular delays reduced by each improvement type. As part of this effort the consultant shall evaluate the design criteria, design variances/exceptions, constructability and impacts (Right of Way, drainage, permits, utilities, environmental, access

management, American with Disabilities Act, etc.) of the alternatives.

Subtask 4A (e) Products

i) Proposed improvement sketches
ii) Analysis of effectiveness for each improvement

Subtask 4A (f) Development of Preliminary Cost Estimates, Project Benefits

The Consultant shall determine a preliminary cost estimate (which will include PE, CEI and contingencies; also R/W if available), of the proposed improvement using recent Department historical cost data or other method as approved by the Department's Project Manager. The cost estimate shall make a distinction between the cost of the safety and operational improvements separately, so that safety and operational benefits can be clearly identified. Therefore, separate cost estimates for operational and safety improvements shall be submitted. The Consultant shall also determine the project/user safety and operational benefits resulting from implementation of the improvements identified. Project/user benefits will include such items as crash reduction, reduction in number of stops and delays and savings in fuel consumption. Nationally recognized references (such as those published by U.S.D.O.T.) shall be used to ascertain these benefits with the approval from the Department's Project Manager. The Consultant shall develop a safety benefit/cost ratio, an operational benefit/cost ratio and a total benefit/cost ratio for each of the proposed alternatives.

Subtask 4A (f) Products

i) Cost Estimates for Proposed Improvements
   - Safety
   - Operational

ii) Benefit/Cost Ratios
   - Safety
   - Operational
   - Total

Subtask 4A (g) Report

The products of previous subtasks within this study shall be analyzed collectively. The consultant shall then form an Arterial Analysis report. The report shall recommend, in consideration of accepted traffic engineering practice and optimal project/user benefits, a coordinated sequence of improvements to enhance motorist safety (by reduction in crashes and their severity) and/or increase the efficiency of traffic flow along the arterial corridor. The sketches for the existing conditions as well as proposed improvements shall be included in the report. Recommended improvements shall be based upon consideration of all relevant corridor elements (including the crash history) and shall be directed at improving access, circulation, travel time, delays, stops, motorist safety, and fuel consumption. Emphasis should be given to those projects having low cost

and high impact.

Subtask 4A (g) Products

i) Three (3) draft copies and three (3) final copies signed and sealed of arterial analysis report.
ii) PDF format report on a CD

SERVICE TYPE 5- LEFT TURN PHASE WARRANT ANALYSIS

Task 5A - Left Turn Phase Warrant Analysis

The Left Turn Phase Warrant Analysis is the study used to evaluate a location for a possible protected left turn signal phase at an existing signalized intersection. Although the Manual on Uniform Traffic Control Devices (2009, MUTCD) provides no left turn phasing warrants, the *Traffic Control Devices Handbook* (Section 4C-1) offers suggested guidelines for separate left turn phasing. As an absolute minimum, the Left Turn Phase Warrant Analysis will include the following activities.

Subtask 5A (a) Delay Study

An Intersection Delay Study shall be conducted to include two (2) approaches (one lane group/one movement per approach). The study will include a total of four (4) hours, two (2) hours each for the morning and afternoon peak periods, unless otherwise specified by the Department's Project Manager. This study shall be performed in accordance with the MUTS or other method approved by the Department's Project Manager. The study will provide measures of delays for the left turn vehicle movements only. If the vehicle delay cannot be measured for the left turn movements (i.e. when no exclusive left turn lane provided) then delay for the whole approach shall be collected.

Subtask 5A (a) Products

i) Delay Study
ii) Technician's worksheets

Subtask 5A (b) Intersection Inventory

The Consultant shall conduct a field inventory of the intersection under study and prepare a detailed condition diagram on standard Department form contained in the MUTS or in another format approved by the Department. Condition diagrams should be created using CADD (DGN format) and shall include intersection geometry, lane use/arrangements, and identification of all traffic control devices including pedestrian features, and other roadway or roadside elements that contribute to the quality of intersection operation or safety such as bus stops, school zones, sight distance obstructions, etc. within 300 feet.

Subtask 5A (b) Product

i) Condition Diagram

Subtask 5A (c) Crash Analysis

The consultant shall analyze the crash data, collision diagrams and identify abnormal crash characteristics or patterns. The Consultant will develop a list of possible causes and countermeasures for each abnormal crash pattern. These causes must be site specific, identified during field review of the location under study. The Consultant's engineer will quantify the abnormal crash history whenever possible using scientifically based methods such as expected value analysis, safety ratio, confidence level, statewide crash rates, or other statistical method.

Subtask 5A (c) Products

i) Crash analysis (include crash summary sheets & collision diagrams)
ii) Abnormal crash characteristics/patterns
iii) Possible crash causes and countermeasures for each abnormal pattern

Subtask 5A (d) Level of Service Analysis

Using methodology based on the 2010 HIGHWAY CAPACITY MANUAL (HCM 2010), the Consultant shall determine the existing level of service for the morning and afternoon peak periods. If a left turn phase is warranted or recommended then the Consultant shall determine the level of service with the proposed phasing and timing. If a left turn phase is not warranted nor recommended then the Consultant shall optimize the existing phasing and timing in order to improve the operation of the intersection.

Subtask 5A (d) Products

i) Level of Service for existing conditions
ii) Level of Service for optimized existing conditions
iii) Level of Service of proposed conditions
iv) Summary of proposed recommendations

Subtask 5A (e) Report

The products of previous subtasks within this study shall be analyzed collectively. The consultant shall then perform a left turn phase warrant analysis. All appropriate recommendations shall be included in the report.

Subtask 5A (e) Products

i) Three (3) draft copies and three (3) final copies signed and

sealed of left turn phase warrant analysis report
ii) PDF format report on a CD

SERVICE TYPE 6 - SUPPLEMENTAL TASKS

Task 6 - Supplemental Tasks

The activities outlined below as subtasks can be performed as supplements to and in support of the Qualitative Assessment, Signal Warrant Analysis, Intersection Analysis, Arterial Analysis, and/or Left Turn Phase Warrant Analysis. These supplemental tasks may alternatively be required to be performed separately or together to form a specialized or composite study, thus enabling the Department to utilize the services of the Consultant in solving a variety of traffic safety and operational problems.

Subtask 6A (a) 72-Hour Traffic Counts

The Consultant shall collect hourly traffic count data broken down into 15-minute increments on each approach to the intersection of a minimum period of 72 hours during typical weekday traffic conditions. Automatic devices furnished by the Consultant shall record count data.

Subtask 6A (a) Product
i) 72-hour Volumes (per intersection)

Subtask 6A (b) 7 Day Traffic Counts

The Consultant shall collect hourly traffic count data broken down into 15-minute increments on each approach to the intersection for a period of seven (7) days. Automatic devices furnished by the Consultant shall record count data.

Subtask 6A (b) Product
i) 7 Day Volumes (per intersection)

Subtask 6A (c_1) Turning Movement Counts

The Consultant shall perform four (4) hour turning movement counts for all approaches as directed by the Department's Project Manager. Fifteen minute turning movement volumes (to include trucks, but tabulated separately) and pedestrian volume shall be taken during the same four (4) hours, two (2) hours each for the morning and afternoon peak periods or as specified by the Department's Project Manager.

Subtask 6A (c_1) Products

i) Four (4) hours turning movement volumes (per intersection)
ii) Four (4) hours pedestrian volumes (per intersection)

Subtask 6A (c_2) 6-Hour Turning Movement Counts

The Consultant shall perform six hour turning movement counts for all approaches as directed by the DPM. Fifteen minute turning movement counts (to include trucks, but tabulated separately) and pedestrian counts shall be taken during the same six hours, for each peak period or as specified by the DPM.

Subtask 6A (c_2) Products

i. Six hour turning movement counts (per intersection).
ii. Six hour pedestrian counts (per intersection).

Subtask 6A (c_3) 8-Hour Turning Movement Counts

The Consultant shall perform eight hour turning movement counts for all approaches as directed by the DPM. Fifteen minute turning movement counts (to include trucks, but tabulated separately) and pedestrian volume shall be taken during the same eight hours as specified by the DPM.

Subtask 6A (c_3) Products

i. Eight-hour turning movement counts (per intersection).
ii. Eight-hour pedestrian counts (per intersection).

Subtask 6A (d) Intersection Inventory

The Consultant shall conduct a field inventory of each intersection under study and prepare a detailed condition diagram on standard Department form contained in the MUTS or in another format approved by the Department. Condition diagrams should be created using CADD (DGN format) and shall include intersection geometry, lane use/arrangements, and identification of all traffic control devices including pedestrian features, and other roadway or roadside elements that contribute to the quality of intersection operation or safety such as bus stops, school zones, sight distance obstructions, etc. within 300 feet. It shall also include any roadway features that may be impacted by any proposed alternatives.

Subtask 6A (d) Product

i) Condition Diagram

Subtask 6A (e) Crash Analysis

The consultant shall analyze the crash data, collision diagrams and identify abnormal crash characteristics or patterns. The Consultant will develop a list of possible causes and countermeasures for each abnormal

crash pattern. These causes must be site specific, identified during field review of the location under study. The Consultant's engineer will quantify the abnormal crash history whenever possible using scientifically based methods such as expected value analysis, safety ratio, confidence level, statewide crash rates, or other statistical method.

Subtask 6A (e) Products

i) Crash analysis
ii) Abnormal crash characteristics/patterns
iii) Possible crash causes and countermeasures for each abnormal pattern

Subtask 6A (f) Travel Time and Delay Study

The Consultant shall perform standard travel time and delay studies along the subject arterial using the manual method or the computerized, both of which are demonstrated in the Manual on Uniform Traffic Studies (MUTS). The Department's Project Manager must approve other state-of-the-art techniques.

Travel time and delay studies shall be conducted in each direction of travel during the morning and evening peak traffic periods and also during a daytime off-peak period. A minimum of six (6) runs shall be made for each direction and time period. Travel time and delay studies will be conducted along a study section which for the purpose of this contract is assumed to be an urban section to be one mile in length with 4 signals or less, or a two (2) mile rural section with not more than two (2) signals. From the travel time and delay data, a speed profile shall be developed for each condition. The profiles shall be supplemented with a written analysis of the location and determination of possible causes of the measured delays and constrained running speeds.

Subtask 6A (f) Products

i) Travel time and delay profiles
ii) Travel time and delay analysis
iii) Summarized data & most prominent delay location

Subtask 6A (g) Intersection Delay Study

An Intersection Delay Study shall be conducted to include two (2) approaches (one lane group/one movement per approach). The study will include a total of four (4) hours, two (2) hours each for the morning and afternoon peak periods, unless otherwise specified by the Department's Project Manager. This study shall be performed in accordance with the MUTS or other method approved by the Department's Project Manager. The study will provide some basic measures of delays, such as the average vehicle delay, presently existing at the intersection. This will cover both signalized and un-signalized

intersections.

Subtask 6A (g) Products

i) Intersection delay study
ii) Technician's worksheets

Subtask 6A (h) Queue Analysis

The Consultant shall collect data/measure existing queue lengths during typical weekday AM and PM peak periods at all intersection approaches. Field observations are to be compared with calculated queue using the methods outlined in Institute of Transportations Engineers (ITE) Traffic Engineering Handbook, or other method to be approved by the Department's Project Manager.

Subtask 6A (h) Products

i) Existing queue length data
ii) Queue length predictions for improvement alternatives
iii) Potential improvements
iv) Technician worksheets

Subtask 6A (i) Vehicle Gap Measurements

The Consultant shall measure the gaps between vehicles at specified locations in accordance with the MUTS and shall record and summarize the data on standard Department forms contained in MUTS.

Subtask 6A (i) Products

i) Vehicle gap measurements
ii) Technician's worksheets

Subtask 6A (j) Conflict Analysis

The Conflict Analysis shall be consistent with methodology as presented in the ITE Manual of Transportation Engineering Studies. The Consultant shall field observe and record all conflicts and their frequencies. Conflict types are to include but not limited to: slow vehicle, lane change, and left-turn all directions, angle, U-turn, right-turn all direction, 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 one highly qualified traffic engineer, registered in the state of Florida (PTOE Certified Preferred) with practical/operational experience for all conflict observations. There are to be four thirty minute periods for observation and collection of data; AM period, mid-day period, PM period, and one off peak period.

Subtask 6A (j) Products

i) Conflict summaries
ii) Conflict diagram
iii) Summary of significant conflicts

Subtask 6A (k) Level of Service Analysis/Optimization (Intersections)

Using a methodology based on the 2010 HIGHWAY CAPACITY MANUAL (HCM 2010), the Consultant shall determine the existing and proposed level of service for the existing conditions and the proposed improvement projects as directed by the Department. An operational analysis will be used for critical intersection(s). The results of this subtask may be included as an Appendix to the Conceptual Study Report. Additionally, the Consultant shall optimize the signal timing for existing and proposed conditions.

Subtask 6A (k) Products

i) Level of Service for existing conditions
ii) Level of Service for optimized existing conditions
iii) Level of Service of proposed alternatives
iv) Summary of proposed recommendations

Subtask 6A (l) Arterial Analysis/ Traffic Signal Optimization

Using methodology based on the 2010 HIGHWAY CAPACITY MANUAL (HCM 2010), the Consultant shall determine the roadway's existing and proposed level of service (LOS) for the existing conditions and for each of the three proposed alternatives. An operational analysis will be used for the arterial(s). For urban and suburban streets with signal spacing less than two miles, the methodology outlined in chapter 16 of the 2010 HIGHWAY CAPACITY MANUAL (HCM 2010) shall be used. For two-lane and multilane highways, the methodologies outlined in chapter 14 or 15 (whichever is applicable) of the HIGHWAY CAPACITY MANUAL (HCM) shall be used.

This analysis shall also include LOS analysis for the individual intersections within the arterial under study, (chapters 18 and 19 of the HIGHWAY CAPACITY MANUAL (HCM) for signalized and un-signalized intersections respectively).

The Consultant shall use Transyt 7F or Synchro for signal system optimization; or in the case of a diamond interchange, PASSER III. The consultant may also be required, when requested by the Department's project manager, to use the CORSIM model to evaluate the existing and the three proposed alternatives, (this task will be negotiated separately). The consultant shall analyze various traffic signal control alternatives and determine the optimal strategy using the measure of effectiveness produced by the program as a guide. Controller type, phasing, cycle length, and splits shall be determined for two periods of the day. In developing the optimum control parameters, the Consultant shall take into consideration the Metro-Dade or Monroe County system requirements (i.e. cycle length, minimum greens, etc). Optimization of the

signal operation shall be evaluated for each candidate geometric modification and each potential combination of modifications.

Subtask 6A (l) Products

i) Analysis of effectiveness for existing and the alternatives
ii) Optimal signal control parameters
iii) Summary of proposed recommendations
iv) Revised controller timing sheets
v) CORSIM input and output file (when requested by the project manager as part of the analysis)

Subtask 6A (m) Pedestrian Group Size and Counts

The consultant shall collect pedestrian counts and group size data in accordance with the Departments Manual on Uniform Traffic Studies (MUTS) during the morning (2 hours) and evening (2 hours) peak traffic periods or other period as specified by the Department's project manager (crash peak).

Subtask 6A (m) Product

i) Pedestrian group size and counts

Subtask 6A (n) Spot Speed Study

The Consultant will obtain speed data for both directions of traffic by means of detection and relay devices or radar or other method with approval of Departments Project Manager. The speed parameters to be determined are: 85th percentile speed, average speed, speed variance, and pace.

Subtask 6A (n) Products

i) 85th percentile speed
ii) Average speed
iii) Speed variance
iv) Pace

Subtask 6A (o) Sight Distance Study

The Consultant will measure available sight distance for one approach (stopping, passing, or intersection) and compare it with appropriate criteria (AASHTO, MUTCD, FDOT, etc.) Sight distances must be depicted graphically.

Subtask 6A (o) Products

i) Measured sight distance

Subtask 6A (p) Highway Lighting Study

The Consultant will determine the adequacy of existing lighting systems and the need for new, additional or improved lighting systems. The Consultant will choose a lighting study technique (AASHTO Criteria, NCHRP Report No. 152 Method, Light Meter, etc.) and get the Project Manager' s approval before usage.

Subtask 6A (p) Product

i) Lighting evaluation, adequacy, and recommendation

Subtask 6A (q) Safe Curve Speed Study

The Consultant shall determine the need for maximum safe advisory speed signs and the maximum safe speed for a given curve, according to the Department's Manual of Uniform Traffic Studies (MUTS). The Consultant will record and summarize the data on standard Department forms contained in the MUTS or other equivalent forms approved by Project Manager.

Subtask 6A (q) Products

i) Recommended advisory speed for curve
ii) Technician worksheets

Subtask 6A (r) Collision Diagrams

The Consultant shall prepare collision diagrams for the study intersection for the last three (3) years. Collision diagrams shall be drawn using CADD (DGN format) on standard Department forms contained in the MUTS or another Department approved form. Collision diagrams for arterials will be negotiated separately.

Subtask 6A (r) Product

i) Collision diagram

Subtask 6A (s) Crash Review

The Consultant shall review a minimum of three years of crash history of the intersection. This review includes the preparation of crash summary sheets. The crash summary shall at a minimum include the classification of crashes by type, time of day, day of the week, direction of travel, and month. Injury severity must also be documented in the summary as well as

weather and lighting condition under which the crash occurred. Consultant shall calculate the safety ratio and confidence level for the spot under study and thus determine if the location is a high crash location.

Subtask 6A (s) Product

i) Crash summary review (include crash summary sheets)

Subtask 6A (t) 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 500 feet of railroad/ highway crossings. To determine if vehicle queues extend to the tracks, use queue length simulation program and verify the results by making observations in the field. The study should be conducted in accordance with the MUTCD and the Department's guidelines reflected in Topic No. 750-020-010-a.

Subtask 6A (t) Product

i) Railroad/highway Crossing Pre-emption Study.

Subtask 6A (u) Parking Study

The purpose of this study is to investigate the safety impact of on-street parking and make recommendations for altering/ removing parking on a given segment of roadway. As part of this study, the Consultant will examine parking-related crashes; investigate the sight-restriction, if any, resulting from parking and parking occupancy rates and available alternative parking in the area.

Subtask 6A (u) Products

i) Parking Study with Recommendations for Modification of parking, if any.

Subtask 6A (v) Intelligent Transportation Systems Studies for Safety Projects

The Consultant shall investigate the feasibility of implementing Intelligent Transportation Systems applications to address operational and safety issues at intersections or corridors. This study may include benefit cost analyses, feasibility studies of equipment installation, perceptions-reaction time evaluation, evaluation of equipment specifications.

SERVICE TYPE 7 - OTHER TRAFFIC ENGINEERING RELATED STUDIES

Task 7 - Other Traffic Engineering Studies

The consultant will be required to perform other traffic engineering related studies. When the need arises a scope of services will be developed and man-hours and fees will be negotiated separately. When requested by the Department's project manager the consultant shall submit a schedule of the tasks to be completed.

SERVICE TYPE 8 – PUBLIC INVOLVEMENT

Task 8 - Public Involvement

As part of any of the above studies, the consultant may be needed for public involvement activities. When the need arises a scope of services will be developed and man-hours and fees will be negotiated separately.

SERVICE TYPE 9 – FATAL CRASH REVIEW

Task 9A - Fatal Crash Review (Field Reviews)

The purpose of this study is to investigate and analyze the fatal crashes (for the purpose of this contract 5 fatal crashes are assumed) and their locations and make recommendations to improve the safety and operation of the locations. As part of this study, a qualified traffic engineer of the firm, experienced in the traffic engineering discipline, and registered in the state of Florida (PTOE Certified Preferred) shall study and investigate the fatal crash and its location and identify any geometric, roadside elements, fixed objects, or traffic control conditions, deficient pavement markings, necessary signage, etc. Photographs shall be taken to identify the various geometric and roadway conditions described earlier.

The Consultant must also review a minimum of three years of crash history of the intersection. This review includes the preparation of crash summary sheets. The crash summary shall at a minimum include the classification of crashes by type, time of day, and day of the week, and month. Injury severity must also be documented in the summary as well as lighting and weather conditions under which the crash occurred.

Based on the investigation of the fatal crash location and the crash review, the Consultant shall make recommendations to improve the safety and operation of the location.

Task 9A Products

I) Fatal crash investigation report with recommendations
II) Crash summary sheets

Task 9B - Fatal Crash Review (Office Reviews)

The purpose of this study is to investigate and analyze the fatal crash (for the purpose of this contract 10 fatal crashes are assumed) and make recommendations to improve the safety and operation of the locations. As part of this study, a qualified Traffic Engineer of the firm shall study the fatal crash report and review the photo logs provided by the Department.

The Consultant must also review a minimum of three years of crash history of the intersection. This review includes the preparation of crash summary sheets. The crash summary shall at a minimum include the classification of crashes by type, time of day, and day of the week, and month. Injury severity must also be documented in the summary as well as lighting and weather conditions under which the crash occurred.

Based on the crash review, the Consultant shall make recommendations to improve the safety and operation of the location.

Task 9B Products

I) Fatal crash report with recommendations
II) Crash summary sheets

SERVICE TYPE 10 – SPEED ZONE STUDY

Task 10 - Speed Zone Study

The purpose of the speed zone study is to establish speed limits along roadway corridors. The study will be conducted along a section that for the purpose of this contract is assumed for an urban section to be one mile in length, or a two (2) mile rural section. The analysis will form the basis for recommended speed limits that provide safe travel for conditions found to exist along the roadway corridor.

Subtask 10 (a) Spot Speed Study

The Consultant will obtain speed data by means of detection and relay devices or radar or other method with approval of Departments Project Manager. The spot speed study shall be conducted for a total of 3 locations. The study shall be conducted for both directions of travel. The speed parameters to be determined are: 85th percentile speed, average speed, speed variance, and pace.

Subtask 10 (a) Products

i) 85th percentile speed

ii) Average speed
iii) Speed variance
iv) Pace

Subtask 10 (b) Crash Review

The Consultant shall review a minimum of three years of crash history of the segment. This review includes the preparation of crash summary sheets and collision diagrams. The crash summary shall at a minimum include the classification of crashes by type, time of day, day of the week, direction of travel, and month. Injury severity must also be documented in the summary as well as weather and lighting condition under which the crash occurred. Consultant shall calculate the safety ratio and confidence level for the spots within the study area and for the segment and thus determine if spots/segment is high crash locations.

Subtask 10 (b) Product

i) Collision diagrams
ii) Crash summary review (include crash summary sheets)

Subtask 10 (c) Assessment of Geometric Conditions

The Consultant will obtain existing plans and/or proposed improvement plans from the Department. The consultant shall review the plans provided and assess the existing and/or proposed conditions and their impact on the speed limits.

Furthermore, a qualified traffic engineer of the firm, experienced in the traffic engineering discipline, and registered in the state of Florida (PTOE Certified Preferred) shall visit the location under study and observe conditions that would have an affect on the speed limits posed along the corridor. These observations should include at minimum, number of signalized intersections, number of connecting roadways and driveways, lateral clearance, pavement condition, presence of pedestrians and parking, visibility, land use, level of roadside development, and posted speed limits.

Subtask 10 (c) Product

i) Assessment of factors affecting speed limits
ii) Recommendation for speed limits

SERVICE TYPE 11 – TECHNICAL MEMO

Task 11 – Technical Memo

Subtask 11(a) Field Review

A qualified traffic engineer of the firm, experienced in the traffic engineering discipline, and registered in the state of Florida (PTOE Certified Preferred) shall visit the location under study during a period specified by the Department's Project Manager to make a judgment on the current level of traffic operations and safety.

The Consultant shall also examine the physical features to document evidence of high-crash conditions and observe traffic movements for high-risk maneuvers. In addition, the Consultant will review geometries and traffic control devices for deficiencies related to abnormal crash patterns, and identify potential driver expectancy problems.

Photographs shall be taken to clarify any unusual findings during the field review. For example, utility conflicts, right of way constraints, obstructions, unusual geometries, deficient pavement conditions or markings, etc. should be photographed and/or otherwise detailed as appropriate. Photos and/or detailed graphics shall be included in the memo.

Subtask 11(b) Crash Review

The Consultant shall also review a minimum of three years of crash history for the location, and note any patterns which would indicate any facility safety deficiencies. Consultant shall also calculate the confidence level for the location under study and thus determine if it is a high crash location.

Subtask 11(c) Technical Memo

The products of previous subtasks within this study shall be analyzed collectively. The consultant shall then form a technical memo, not to exceed five (5) pages. The maximum turn around time for a draft technical memo will be two (2) weeks. The memo shall recommend, in consideration of accepted traffic engineering practice and optimal project/user benefits, a recommendation for any supplemental work tasks. The memo shall contain the following:

Task 11 Products

i) Location map/aerial photographs
ii) Summary of field review
iii) Photographs taken in the field (if required)
iv) Review of crash data with confidence level analysis
v) Analysis

vi) Conclusion/recommendations

SERVICE TYPE 12 -HIGH CRASH SITE SAFETY STUDY

The high crash site safety study is a methodology for prioritizing the review of the District-wide Intersection High Crash List based upon three years of crash data. The various highway sections are prioritized to determine the order in which each one would be studied. This is a study process which incorporates three levels of analysis. A description of each level of analysis follows:

Subtask 12 (a) District-wide High Crash List Development

The Consultant shall develop a prioritized District-wide High Crash List. The Department will provide the Consultant with a list of potential District High Crash Sites generated from its database and the total numbers of severity 4 and 5 crashes at each high crash site in the list. The consultant will then perform a "filtering" process of the potential high crash sites by removing those locations where there is a pending or on-going construction and eliminating those locations that were studied in the previous year high crash list. The Department will provide the Consultant with the Work Program and the Pavement Condition Survey in order to perform this process. With the "filtered" high crash list, the consultant will group the high crash sites by section based on roadway identification number and geometric proximity. Once locations are grouped, the severity level for each section will be calculated. Then, the Consultant will rank each section based upon severity level.

Subtask 12(a) Products

i) High crash list ranked by severity index

Subtask 12(b) Level 1 High Crash Location Studies

From the approved District-wide High Crash List, the consultant will perform systematic office safety review starting with the highest section priority to determine any evidence that suggests the need for further study. The level 1 investigation consists on identifying crash patterns at the high crash locations, and formulating a probable cause for those crash patterns. Each location within a section will be investigated. In performing these safety studies, the Department will make the following data available to the Consultant: video logs, crash reports in GIS format, Miami-Dade County mapping and pertinent internal correspondence. It will be

the Consultant's responsibility to obtain access to Miami-Dade County's signal timing database via the County's password secured system. If in Monroe County, the Consultant shall obtain signal timing from the appropriate maintaining agency. The Consultant will generate a report for each highway section that is studied. This report will include the following: a description of the Highway Section that provides information relating to the study limits, type of facility, Average Annual Daily Traffic (AADT), access management classification, land use, travel lane configuration, any special traffic/roadway/geometric features and a tabulation of the individual high crash sites that comprise the Highway Section; an analysis of each high crash site which will include a description of existing roadway and traffic conditions, an aerial map of the location with a tabulation of three year crash summaries by crash type, an expected value analysis (expected value will be determined for surface and crash type), a discussion of existing and/or abnormal crash patterns and their probable causes, and a recommendation as to the need for further study. Where expected values can not be determined at a high crash site because of its configuration (i.e. expressway ramps or one-way traffic flow), an analysis of existing crash history and probable causes of significant crash patterns will still be provided. It is noted that the Consultant may request the Department approval to conduct field reviews at individual high crash sites in order to better ascertain the potential causes of abnormal or existing crash patterns.

Subtask 12 (b) Products

i) Investigation of aerial photography, video logs, and signal Timings
ii) Crash Analysis
iii) Expected Value Analysis to determine abnormal crash characteristics/patterns
iv) Possible crash causes and countermeasures for each abnormal pattern
v) Three draft copies and three final copies signed and sealed of safety study
vi) PDF format report on a CD

Subtask 12 (c) Level 2 Preliminary Safety Review

Level 2 high crash location investigation follows the Level 1 investigation. The level 2 analysis will verify through field reviews of the study locations and review of the hard copy police reports for level 1 crash data if the probable cause cannot be discarded as a contributory cause. In

addition, it will be formulated a probable cause of the abnormal crash pattern if it was not identified in the level 1analysis performed in the previous level. Also an analysis of the latest crash history will be performed to evaluate the crash trends.

Subtask 12 (c) Products

1. Field Reviews: Perform a one hour field review of each of the study locations in order to identify any operational or geometric conditions that may be contributory to the abnormal crash pattern.

Sub-Tasks/Deliverables

Field review observations

2. Review of Hard Copy Police Reports: Review hard copy police reports of the abnormal crash pattern to determine if any roadway conditions were contributory to the abnormal crash pattern. Formulate probable cause for the abnormal crash pattern if it was not identified in the Level 1 Study.

Sub-Tasks/Deliverables

Identify probable cause

Verify probable cause

3. Develop Recommendations: Develop recommendations for level 3 study or document that additional study is not needed based on the analysis performed.

Sub-Tasks/Deliverables

Recommendations

4. Review Skid Numbers: Review the latest report from the Skid Hazard Reporting System to determine if low skid numbers are a contributory cause of the abnormal crash pattern.

5. Collision Diagrams: This task will be performed according to the scope of services for task 6A(r).

***6. Report*:** Document the analysis and recommendations in report format for each section. Provide three draft reports and three signed and sealed final reports per study section.

Please note that any tasks not described in this scope of services will be negotiated as part of the final submittal.

Subtask 12 (d) Level 3 Additional Studies

Based upon the Department's approval of recommendations from the Level 2 analyses, additional studies may be performed at specific high crash sites. Such studies would be conducted in accordance with the Service Type as described in the existing District-wide Traffic Operations/Safety Studies Scope of Services (See Service Type 3).

Subtask 12 (d) Products

1. (See Service Type 3).

SERVICE TYPE 13 - TRAFFIC OPERATIONS SAFETY REVIEWS + BEFORE & AFTER STUDIES

The objective of these studies is to provide the Department with professional services for conducting needed Rehabilitation, Resurfacing and Reconstruction (3R) safety reviews, as well as, before and after safety studies. The safety review's result, safety review memorandums produced by the Consultant, will provide valuable input for the projects for which they are required. Meanwhile, the before and after safety studies will be used to track the effectiveness of previously implemented safety improvements. A description of each type of study follows:

Subtask (a) Study Type 1-3R Safety Review

The purpose of this study is to identify traffic safety concerns and recommend countermeasures for locations that will be subject to a 3R project. These recommendations will be used in the preparation of the plans packages documents. Established unit price per 3R safety review shall be considered full compensation for all tasks required to perform it. The Department's Safety Project Manager shall have the final say on the expected content of the completed 3R safety review. All recommendations must meet current FDOT Standards and specifications, the guidelines contained in the FDOT Plans Preparation Manual (latest edition), and the Florida's Design Standards for Resurfacing, Restoration, and Rehabilitation.

1.1 Basis of Measurement

For the Purpose of this contract, a location shall be considered any length over which a design project will take place. Fees shall be broken down

according to the following: length (1.5 miles or less, greater than 1.5 miles), number of signalized intersections (5 intersections or fewer on urban settings, and 6 or more in urban settings; 2 or less in rural settings, and 3 or more in rural settings), and the distance of the subject location with respect to the Department's Headquarters.

1.2 Period of Performance

The normal period of performance allowed for completion of a safety review shall be three (3) weeks. Each additional project location in a work order shall add 3 days to the allowed performance period. The Department's Project Manager may allow additional time beyond the normal period as other conditions may warrant.

1.3 Scope of Work

This section specifies the work to be performed by the Consultant, the responsibilities of the Consultant, and those of the Department, as well as, the work task products to be developed by the Consultant, and delivered to the Department.

Item 1 – Department's Design Project Manager Coordination

The Consultant shall be responsible for coordinating all aspects of the safety review with the concerning Department's Design Project Manager. The Consultant responsibilities include obtaining detailed information regarding the scope of the project, its limits, and providing additional safety information to the Design Project Manager when requested. The Consultant shall also coordinate with the Design Project Manager to attend meetings regarding the project where safety issues are expected to be discussed; the consultant shall take notes and address any concerns presented during the meetings. The consultant shall be responsible for producing a brief "meeting notes" report and submit it to the Department's Project Manager.

Item 1Products:

i) Minutes Report.

Item 2 – Data analysis

The Consultant shall be responsible of gathering and analyzing all data deemed necessary for the performance of the Safety Review. The data to be reviewed shall include, but is not limited to, the Department's Segment and Spot High Crash Lists, the summary of the latest 3 years of available crash data, individual crash report for fatal crashes occurring during the same 3 year review period, and the scope of work for the project. Additional items, that may be required as part of the data analysis, might include the preparation of collision diagrams, and the review of individual crash reports, etc.

Item 2 Products:

i) Tables/ Figures summarizing the analysis

Item 3 – Location Safety Assessment

The Consultant shall be responsible for field reviewing the project location and identifying safety concerns associated with geometric alignment, roadway condition, sight distance, peak hour driver behavior, traffic signals, signing and marking, other traffic control devices and pedestrian, bicycle safety concerns. The consultant shall also report any fixed object located within the control zone.

Item 3 Products:

i) Field Notes

Item 4 – Potential Improvements

The Consultant shall be responsible for producing recommendations that will address each one of the identified safety concerns. All recommendations must meet current FDOT Standards and specifications with the guidelines contained in the FDOT Plans Preparation Manual (latest edition) and the Florida's Design Standards for Resurfacing Restoration and Rehabilitation. The Consultant shall be responsible for discussing all recommendations with the Design Project Manager before submission of the Final Memorandum to the Department's Project Manager.

Item 4 Products:

i) Potential Improvements

Item 5 – Preparation and Submission of Memo First Draft Report:

Subsequent to completion of Items 1, 2, 3, and 4, the Consultant shall prepare a draft memo. Two draft copies shall be submitted to the Department for review. The memo shall include, as a minimum, the following information:

a) The section number, state road number, its beginning and ending mile post, the project's financial ID, and the Design Project Manager's name.

b) Crash data in table format approved by the Department Project Manager of the latest three (3) years available. The table shall include, among other information, crashes by type of weather and lighting condition, average daily traffic, and total number of fatal crashes. The consultant shall review, in detail, each fatal crash, and provide recommendations to potentially avoid/prevent similar events. A sample table will be provided by the Department.

c) Identification of safety concerns associated with geometric alignment, roadway condition, sight distance, traffic signals, signing and marking, and other traffic control devices.

d) A set of recommendations targeting each one of the identified safety concerns. These recommendations must be implemented trough the scope of the 3R project, and must meet current FDOT standards and specifications. They must also be in agreement with the guidelines contained in the FDOT Plans Preparation Manual (latest edition) and the Florida's Design Standards for Resurfacing, Restoration and Rehabilitation.

Final Memo:
Following the draft report, and only after having addressed any comments that might have emerged from any of the interested parties, the consultant shall prepare a Final Memorandum. A PDF electronic file shall be submitted to the Department's Project Manager. The Final PDF file shall be submitted to the satisfaction of the Department's Project Manager.

Item 5 Products:

i) Three Draft Reports
ii) Three copies of Final Report signed and sealed.
iii) PDF format report on a CD.

Item 6 – Scope Meeting

The Consultant shall be responsible for attending scope meetings concerning the 3R project in representation of the Department's Safety Program Manager. The consultant shall provide input regarding safety concerns and improvements, and take notes regarding safety related issues discussed at the meeting. The notes taken by the Consultant shall be submitted to the Department Project Manager within five (5) business days.

Item 6 Products:

i) Meeting Notes

Item 7 – Maintenance of the Department's Safety Review Tracking Database

The Consultant shall be responsible for updating and maintaining the Department's schedule (currently kept in Primavera software) used for tracking the design projects for which a safety review will be needed. The Consultant shall be responsible for prioritizing the safety review per the primavera scheduling system. This list shall be submitted to the Department's Project Manager, who will issue a work order(s) to perform the necessary work. The Primavera schedule includes, among other things, information regarding the percentage completion of the safety review, forecasted start, actual start, forecasted finish, and actual finish date for the safety review. The consultant will be responsible for updating and maintaining the safety review activities only. The Consultant shall be responsible for updating and maintaining a Safety Review Database. As a minimum the following fields must be included and maintained in the database regarding each Safety Review: FM number, Date Requested to Consultant, State Road, State Section, Status, Beginning Mile Post (BMP), Ending Mile Post (EMP) Description, FDOT Project Manager, Year Completed, Consultant, Comments, Draft / Final. Any additional fields the consultant believes will assist in tracking the work performed, consultant's performance, and ongoing safety reviews might be added upon approval by the Department Project Manager. For the purposes of this database the consultant is required to use software under license agreement with the Department, this will allow the Department use of the Database even after the services provided by the consultant have ended.

Item 7 Products:

i) Update Database

Subtask (b) Study Type 2-Before and After Safety Studies

The objective of these studies is to evaluate the effectiveness of implemented safety improvements at specific locations. The findings from these studies will allow the Department Project Manager to track the performance of previously implemented safety improvements; it will also provide guidance in the selection of safety improvements for future safety projects The Consultant shall be responsible for analyzing geometric conditions after implementation of improvements.

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2.1 Basis of Measurement

For the purpose of this contract, a location shall be considered any length over which the implementation of the safety improvement(s) under study took place. Fees shall be broken down according to the following factors: number of signalized intersections, median openings, and distance from headquarters.

2.2 Period of performance

The normal period of performance allowed for completion of a Before & After Safety Study shall be three (3) weeks. Each additional location in a work order shall add two (2) weeks to the allowed performance period. The Department's Project Manager may allow additional time beyond the normal period as other conditions may warrant.

2.3 Scope of Work

This section specifies the work to be performed by the Consultant, the responsibilities of the Consultant, and those of the Department, as well as, the work products to be developed by the Consultant, and delivered to the Department.

Item 1 – Geometric Analysis

The Consultant shall be responsible for analyzing geometric conditions

after the improvements under study took place.

Item 2 – Crash Analysis

The Consultant shall be responsible for preparing collision diagrams for the after conditions, and analyzing crash data of the before and after improvements. Three (3) years of crash data before and three (3) years after the improvements took place shall constitute the minimum period of analysis to be used in Before & After studies. Under exceptional conditions, the Department Project Manger shall allow for the elaboration of a Before & After studies covering shorter periods of time. The period of time during which the improvements were being implemented shall not be included in the crash data analysis. The Consultant shall be responsible for identifying and analyzing crash patterns, if any. Crash pattern recognition shall not be limited to those likely caused by geometric conditions; it shall also include those occurring periodically over time i.e. seasonal, nighttime, weekend crashes, etc.

Item 2 Products:

i) Collision Diagrams
ii) Crash Analysis
iii) Abnormal Crash Patterns

Item 3 – Before & After Safety Analysis

The consultant shall be responsible for analyzing the effectiveness of the implemented safety improvements in reducing the targeted crash pattern, as well as, the impact those improvements had in other type of crashes. The consultant shall prepare a Benefit Cost analysis for the After conditions and compare it with that included in the project which recommended the implemented improvements.

Item 3 Products:

i) Prepare a B/C Analysis Comparison Report.

Item 4 – Before & After Operational Analysis

The consultant shall analyze the impact the implemented improvements had in the operation of the transportation facility. To this end, the consultant is free to select any traffic analysis/simulation software that might provide a sound analysis of the facility under study.

Item 4 Products:

i) Prepare an Operational Analysis Report.

Item 5 – Preparation and Submission of Report

First Draft Report: Subsequent to completion of tasks 1, 2, 3 and 4, the consultant shall prepare a draft report. Two paper copies of the draft report along with its respective PDF electronic file shall be submitted to the Department's Project Manager for review. The report shall as a minimum include the following information:

a) State Section number, State Road number, beginning and ending mile post.
b) Geometric analysis for the before and after conditions. Schematic diagrams of the before and after conditions shall be included as part of this section. Should pictures for the Before conditions exist, they shall be included and compared with similar pictures for the After conditions.
c) Crash data analysis for the specified period. Collision diagrams, one per year, or as otherwise requested by the Department's Project Manager shall be included as part of this section.
d) Before & After Safety Analysis.
e) Before and After Operational analysis. The software output shall be included as part of this section.
f) Conclusions

Final Report: only after having successfully addressed any comments that might have emerged from the first draft to the satisfaction of the Department's project Manager, the Consultant shall submit three signed and sealed copies of the Final report, along with its respective PDF electronic file.

Item 5 Products:

i) Three copies of Draft Report.
ii) Three copies of Final Report, signed and sealed
iii) PDF format report on a CD.

Subtask (c) Study type 3.-Miscellaneous/Other 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 rates agreed to in the contract.

Subtask (d) General Requirements

4.1. Department Responsibilities

The Department will furnish the following:
a) Copy of the before study
b) Three (3) years of after crash data.

4.2 Issuance of Work Orders

Authorization to perform study type shall be conveyed to the Consultant through a written work order. The work order shall specify the type of studies to be conducted, the limits of each location, the pre-established unit price for the location and the date on which study reports are to be submitted to the Department. Each work order issued by the Traffic Operations' Project Manager shall serve as formal notice to proceed, and it will be effective on the date of execution or on a subsequent date, if specified.

SERVICE TYPE 14 – ENGINEERING SUPPORT STAFF

The Consultant should provide technical/engineering staff to the Department capable of assisting in the performance of a diverse range of Traffic Safety/Operations Studies and other important work assignments as may be determined by the Department Project Manager (DPM) during the period of the Letter of Authorization. The Consultant might be required to assign a full-time staff person(s) to work under the direct management and supervision of the DPM, which shall be based in the District Six Traffic Operations Office. Working hours for the assigned staff person(s) shall be under the Department's normal working hours unless modified by the DPM and approved by the Consultant's Project Manager.