

9-1-1

UNION COUNTY EMERGENCY TELEPHONE SYSTEM BOARD

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**EXHIBIT 10.1
TEST PLAN
(INTEGRATED)**

EXHIBIT 10.1

Exhibit 10.1

In each Diagram, the 9-1-1 call flow is reflected from Left to Right, from Access through the options of the Transport Carrier network, to the Selective Routers Existing and Future to the PSAPs serving the ETSB for call completion. The numbers of Trunks comes from PSAP documents. All of Union County is in the 618 Area Code. The 3 digit codes in the access column are the NXXs that belong to the Access Carriers all or in part. On any given day ~70% of the calls for 9-1-1 come from the Wireless and VoIP category of callers. The remainder approximately 30% originates in the Landline networks. If Union County had calls routed from PS/ALI customers directly to the Selective Routers they would be shown as an additional Access category. There are no direct PS/ALI customers routing to PSAPs directly today.

The name of the Carrier and the Telecommunications Rate Center is provided in the Access category. The LERG assigned originating Switch Common Language Location Identifier (CLLI) is included if published or known to Union County. Numbers of trunks are shown and the designation of Host and Remote is provided as appropriate in the case of the Wireline Carriers. Frontier Communications is the ILEC for Union County. . There are no Independent ILEC in Union County.. 9-1-1 trunk groups for Host offices connect to the Legacy Selective Routers today. The Remote offices are on umbilical routes through the Host offices to get 9-1-1 traffic routed in all cases in Union County. The Host office may be located in a County other than Union. If so, the Host County name was designated.

Wireless Carriers sometimes route to the Union County PSAPs through aggregation by another Carrier. For example, Intrado and TCS provide Aggregation and Routing services to some Wireless Carriers.

VoIP Carriers are often represented by Level 3 Communications who aggregates their traffic and in most cases, bringing that traffic into the Union County network.

CLECS operate in the Union County ETSB jurisdiction. The CLECS shown are facilities based Carriers. We show their CLLI if it is known. Some will connect directly such as Clearwave. Resellers will be handled by the underlying carrier.

Split Exchanges and those opted out are shown in the Narrative and on the Union County Diagram. Frontier and NG-911, Inc. have a Database management agreement to use the legacy selective router as a Split Exchange Router for this application.

The Legacy Selective Router column name was retained in the new Diagrams, but what is called the "IP Selective Routers" are really the collection of FEs with all of the NG9-1-1 functions, security, database and routing in separate FEs housed in the 2 Data Centers.

The PSAPs are in the final column. For Union County nothing changes except the calls come from the 2 Data Centers starting with this Union County application.

NG-911, Inc. Integrated Test Plan

Coordinate with Exhibit 10.2 FAS Test Plan

December 2013

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1.0 Overview

This NG-911, Inc., Integrated Test Plan has been developed to test the functionality of the Next Generation 9-1-1 network architecture being deployed by NG-911, Inc., the SSP for Union County. The intent is to deploy an IP-Based Next Generation 9-1-1 communication system that meets NENA NG 9-1-1 standards, including the emerging NENA IP-Capable PSAP standards. The desired results will be increased functionality, redundancy, diversity, and scalability.

Each test case has been identified with a specific Test Case number, Test Case Description, the Expected successful outcome of the Test Case and the Actual outcome of the Test Case. There are some tests that do not require any traffic or call attempt results, and those can be performed any time. There is a distinction between Access Testing and Network testing of the NG9-1-1 Architecture. Access Carriers using direct facilities and trunking into the Union County NG 9-1-1 network FEs are distinguished from Access Carriers using the Frontier Aggregation Solution, FAS. There is a complementary Test Plan agreed upon between Frontier Communications, and NG-911, Inc. for the calls going through the FAS solution. Refer to Exhibit 10.2, FAS Test Plan.

Network Test calls will be made prior to live activation of the 9-1-1 service and Access Test calls to validate end to end performance. Some Tests are designed to demonstrate performance of the Network.

Section 3 first describes the results of tests performed with the Illinois Institute of Technology, (IIT), which determined that key components of the network design functioned in a resilient and secure fashion, and performed well under a simulated load. Section 3 describes the tests to be performed and documented.

Section 4.0 describes the testing performed with various vendors of the FEs, taking advantage of tools and automated procedures used during installation validation.

Appendix A provides a Standards Trouble Reporting and Resolution Template

Appendix B provides a General Trouble Reporting and Resolution Template

Appendix C provides an End to End Testing Template

Appendix D provides a County Carrier Test Numbers for NPA NXXs Template

2.0 Next Generation 9-1-1 System Requirements Test Cases

The following sections provide a brief description of the various functions related to the ESInet and i3 specifications as well as test cases and expected responses for each function. The test cases have also been ordered such that they build on data that is produced by a previous test case. The test areas are listed below.

1. Network and Carrier Configuration Test Scenarios
2. PSAP Configuration Test Scenarios
3. Future PSAP Configuration Test Scenarios
4. TDD/TTY Configuration Test Scenarios
5. Logging and Instant Recall Recorders Test Scenarios
6. Management Information Systems Test Scenarios
7. System Administration Test Scenarios
8. System Performance Test Scenarios
9. System Monitoring Test Scenarios
10. Master Clock Test Scenarios
11. Administrative Reports Test Scenarios

Note on adherence to applicable standards:

It should be noted that the test cases performed below serve also as test cases for the NENA standards that comprise the Next Generation 9-1-1 system functional elements and protocols. In particular, this test plan will validate the following list of NENA standards as they apply to this project. For terminology definitions refer to the NENA Standards.

- Flexible Call routing via Emergency Services Routing Protocol (ESRP)
- Database queries
- Origination using legacy signaling through the Legacy Network Gateway (LNG)
- SIP Origination using SIP Protocol, through the Border Control Function (BCF)

2.1 Network and Carrier Configuration Test Scenarios

The following test cases support various Network and Access Carrier Configurations. The test cases that are relevant to a particular type of Access Carrier facility can be tested as those particular facilities are activated. If feasible, the Test Cases that represents a facility type for which there is multiple Access Carriers and will be repeated for each Carrier.

Note: Test Cases that will be used for Access Carriers connected Directly to the NG9-1-1 network on an end to end basis are noted with a single asterisk (*). Test Cases that will be used for Access Carriers connected indirectly through the FAS solution are included with a double asterisk (**). Test Cases that will be used in both Access Carrier scenarios are shown with both indicators. Refer to the Exhibit 10 Network Diagram for the Direct and Indirect Access Carriers by name.

The Templates will be used to track the results that are required to be tested end to end and by Carrier.

Test Case #	Test Description	Expected Test Outcome Notes	Results/Date/Initials
NG-NC-001* **	Demonstrate the ability to support multiple types of inbound and outbound analog or digital Central Office or End Office provisioning, such as SS7, PRI/ISDN,	Received SIP calls from Clearwave.	Tested CAMA and SIP signaling. SIP from Clearwave 5/6/13
NG-NC-002* **	Demonstrate the ability to provide a local termination/demarcation point for carriers while maintaining overall call routing configuration.	Clearwave Test numbers route to POI	Clearwave testing Successful 5/16/13
NG-NC-003* **	Test that the solution is capable of receiving both 9-1-1 and administrative calls in a native SIP format upon installation.	Able to answer and talk	Received Clearwave SIP calls May 2013
NG-NC-004* **	Test for the ability to accept automated update of Selective Routing information from MSAG processing.		
NG-NC-005* **	Test for a situation where a primary PSAP is out of service or that all circuits to that PSAP are out of service, 9-1-1 calls can be routed to an alternate PSAP.	Testing situation where there is no connectivity / No Power or no one logged in.	
NG-NC-006* **	Test that the system can provide the ability to test inbound call routing of all carriers on an ongoing basis.		
NG-NC-007* **	Test for the ability to support additional one-button transfers to other entities.		
NG-NC-008* **	Test that transferred calls can provide original caller's ANI/ESRK rather than the PSAP's ID.		

NG-NC-09* **	Test for real-time measurement of Quality of Service for network infrastructure.		
NG-NC-010* **	Test for applicable bandwidth requirements including between PSAPs and support facilities.		
NG-NC-011* **	Test that System provides a native IP environment for the receipt of Voice over Internet Protocol (VoIP) 9-1-1 calls with associated data is available.		Clearwave calls successfully routed and answered at correct PSAP May 2013

2.2 PSAP Configuration Test Scenarios

The following test cases align with the requirements to support various PSAP Equipment configurations. The test cases that are relevant to a particular type of call origination type can be tested as those particular facilities are activated.

Test Case #	Test Description	Expected Test Outcome Notes	Results/Dates/Initials
NG-PSAP-001*	Validate that all material respects to current NENA recommendations for PSAP Equipment.		PSAP Equipment is NENA Compliant
NG-PSAP-001-1*	Validate that all material respects to current NENA recommendations for NENA 04-001, Standards for PSAP Equipment		PSAP Equipment is NENA Compliant
NG-PSAP-001-2*	Validate NENA 04-004, Standards for PSAP Intelligent Workstations		Workstations are NENA Compliant
NG-PSAP-001-3*	Validate NENA 08-002, Functional and interface Standards NG9-1-1 (i3)		Functional and interface Standards re NENA Compliant
NG-PSAP-001-4*	Validate NENA 08-501, Network Interface to IP capable PSAP		Network Interface is NENA Compliant
NG-PSAP-001-5*	Validate that a back-up SIP phone that is located at each call taker position can display ANI/ALI.		
NG-PSAP-002*	Validate the backup telephone instruments are provided with handsets and function independently or in parallel with the Intelligent		

	Work Stations.		
NG-PSAP-003*	Validate the ability to place calls on hold for retrieval by any call taker (Call Park).		
NG-PSAP-004* **	Test for the delivery of Automatic Number Identification (ANI) and Automatic Location Identification (ALI) data display in a consistent format regardless of the originating carrier or routing of the call.	Receive ANI/ALI	Tested Clearwave May 2013. Received ANI/ALI
NG-PSAP-005* **	Validate that PSAP equipment can retrieve ALI equivalent information from database system.	Eq. Can retrieve ALI information	Tested with Clearwave May 2013
NG-PSAP-006* **	Validate that PSAP equipment can provide for ALI retrieval from Caller ID (Business Lines) or manually entered telephone number.		Manually enter number is complete July 2013
NG-PSAP-007* **	Validate that the System can accommodate the handling and display of Wireless 9-1-1 Phase I and Phase II information.		
NG-PSAP-008* **	Test for the ability to support access to wireless databases		
NG-PSAP-09*	Validate the presence of an Intelligent Workstation platform to support the installation of third-party applications.		
NG-PSAP-010*	Validate that peripheral network components (such as telephone instruments) outside of centralized equipment rooms deliver supplemental electrical power via Power Over Ethernet (POE) provisioning.		
NG-PSAP-011*	Test the ability to monitor the audio of call taking at another position, with or without muting.	Can monitor call – muted and not muted	Monitored calls with muting November 13, 2013
NG-PSAP-012*	Test the ability to 'barge-in' to a call in progress by supervisory personnel.	Can barge in on a call in progress	Barged in call in progress November 13, 2013
NG-PSAP-013*	Test the ability to conference calls with unlimited outside party's vendor to describe any limitations.		
NG-PSAP-014*	Test the ability to support separate inbound call queues if circuit provisioning is deployed.		

NG-PSAP-015*	Test the ability to support one-button re-dialing of recent calls, including abandoned calls.		
NG-PSAP-016* **	Validate the ability to capture abandoned call information for call taker use.		
NG-PSAP-017* **	Test the ability to display location information at each call taker position for calls pending.		
NG-PSAP-018*	Test the ability to provide system-wide status at each PSAP, reflecting system availability, calls in progress, call taker availability, and calls in queue.		
NG-PSAP-019* **	Validate the Creation of Incoming Call Queues		
NG-PSAP-020* **	Validate the Creation of Spatial Incoming Call Queues		
NG-PSAP-021* **	Test the ability to integrate two-way audio from telephone calls and radio traffic into one headset		

2.4 TDD/TTY Configuration Test Scenarios

The following test cases support various TDD/TTY configurations.

Test Case #	Test Description	Expected Test Outcome Notes	Results/Dates/Initials
NG-TDD-001*	Validate the ability to support Baudot-format TDD/TTY dialogue from callers at every position.		
NG-TDD-002* **	Validate the ability to provide TDD/TTY detection and alerting at each call taker position		

2.6 Logging and Instant Recall Recorders Test Scenarios -

The following test cases support Logging and Instant Recall Recorders..

Test Case #	Test Description	Expected Test Outcome	Results/Dates/Initials
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		Notes	
NG-LOGIR-001* **	Test the Instant Recall Recording and playback application software at each workstation position with the ability to integrate with existing analog voice logging recorder at each PSAP.	Workstation will have IRR functionality	Tested Instant Recall Recording on all work stations March 2012

2.7 Management Information Systems Test Scenarios –

The following test cases support Management Information Systems..

Test Case #	Test Description	Expected Test Outcome Notes	Results/Dates/Initials
NG-MIS-001* **	Validate the System Management Information System (MIS) reporting of transaction volumes and system performance for overall system as well as significant components.		
NG-MIS-001-a* **	Test that the MIS and reporting application can allow access to all captured database elements.		
NG-MIS-001-b* **	Test the Detail of MIS reporting to provide for both individual PSAP and system-wide transaction volumes and call handling performance.		
NG-MIS-001-c* **	Test that the MIS reporting can provide for time and day of week in tabular and graphical formats.		
NG-MIS-001-d* **	Test that the Reporting application can provide for selection of indexing and sorting keys by any formatted field.		
NG-MIS-001-e* **	Test that the MIS can capture and report System Availability, including alarms, error reports, and platform status.		
NG-MIS-001-f* **	Test that the MIS can capture response time to PSAP ALI database inquiries and re-bids.		
NG-MIS-001-g* **	Test that the MIS is be capable of capturing		

	data from all circuits within the system, including inbound 9-1-1trunks, administrative lines as well as outbound calling.		
NG-MIS-002* **	Test that access to information shall be acquired remotely by permissions.		
NG-MIS-002-a* **	Test that the MIS can collect data on the Number of total calls received		
NG-MIS-002-b* **	Test that the MIS can collect data on the Number of abandoned calls		
NG-MIS-002-c* **	Test that the MIS can collect data on the Number of calls on a per trunk/per circuit basis		
NG-MIS-002-d* **	Test that the MIS can collect data on the Number of calls on a call type (wire line, wireless, VOIP, etc.) basis		
NG-MIS-002-e* **	Test that the MIS can collect data on the Number of calls conference/transferred		
NG-MIS-002-f* **	Test that the MIS can collect data on the Calls conference/transferred by destination		
NG-MIS-002-g* **	Test that the MIS can collect data on the Number of calls on a log-on or per position basis		
NG-MIS-002-h* **	Test that the MIS can collect data on the Average time to answer		
NG-MIS-002-i* **	Test that the MIS can collect data on the Average length of call and average hold time		
NG-MIS-003* **	Test that each data center is equipped with a Call Detail Record (CDR) function that provides for capture, search and retrieval, display, and printing of information regarding each 9-1-1 call. The MIS be able to process data with the following configurations.		
NG-MIS-003-a* **	Test that the MIS can collect data on the Date received		
NG-MIS-003-b* **	Test that the MIS can collect data on appearance time		
NG-MIS-003-c* **	Test that the MIS can collect data on the		

	Caller's telephone number		
NG-MIS-003-d* *** **	Test that the MIS can collect data on the ANI, ESRK or other routing identification		
NG-MIS-003-e* **	Test that the MIS can collect data on the Answer time		
NG-MIS-003-f* **	Test that the MIS can collect data on the Answering position identification		
NG-MIS-003-g* **	Test that the MIS can collect data on the Trunk/circuit identification		
NG-MIS-003-h* **	Test that the MIS can collect data on the Time call was released		
NG-MIS-003-i* **	Test that the MIS can collect data on the Time call was transferred		
NG-MIS-003-j* **	Test that the MIS can collect data on the Transfer destination		
NG-MIS-003-k* **	Test that the MIS can collect data on the Abandoned call indicator		
NG-MIS-003-l* **	Test that the MIS can collect data on the Ringing start time		
NG-MIS-003-m* **	Test that the MIS can collect data on the Time call was placed on hold and taken off hold and by what position		
NG-MIS-003-n* **	Test that the MIS can collect data on the All ALI data, including name, address, Community, ESN, Class of Service, etc. Test data may be accessed remotely from the PSAPs with permissions.		
NG-MIS-004*	Test the ability to direct MIS reports or Workstation printouts to any Local Area Network-attached printer.		
NG-MIS-005*	Test the ability to export formatted detailed records or summary report tables for analysis with third-party applications (e.g., Microsoft Office)		
NG-MIS-006*	Test the ability of the MIS reporting to be fully initialized prior to operational use of system; this		

	includes any procedures, routines and scripts for daily, monthly and annual periodic reporting.		
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2.8 System Administration Test Scenarios

The following test cases support System Administration.

Test Case #	Test Description	Expected Test Outcome Notes	Results/Dates/Initials
NG-SA-001*	Test the ability to administer call queuing and call routing parameters.		
NG-SA-002*	Test the ability to support centralized and administered backup and recovery policies.		
NG-SA-003*	Test the ability to support on-line centralized backup		
NG-SA-004*	Test that the system can provide real-time call volume and call status information at remote locations		
NG-SA-005-a*	Test that the system can provide Positions Logged On/Ready/Available		
NG-SA-005-b*	Test that the system can provide Positions Busy/Off Hook		
NG-SA-005-c*	Test that the system can provide Positions Not Ready/Out of Queue		
NG-SA-005-d*	Test that the system can provide Calls in Queue/Calls Pending		
NG-SA-005-e*	Test that the system can provide Calls Holding/Calls Parked		
NG-SA-005-f*	Test that the system can provide PSAP Status (e.g., system OK, connectivity good)		
NG-SA-006*	Test that the system can provide the Ability to provide a real-time display of system availability, call taker availability & calls in progress.		

2.9 System Performance Test Scenarios

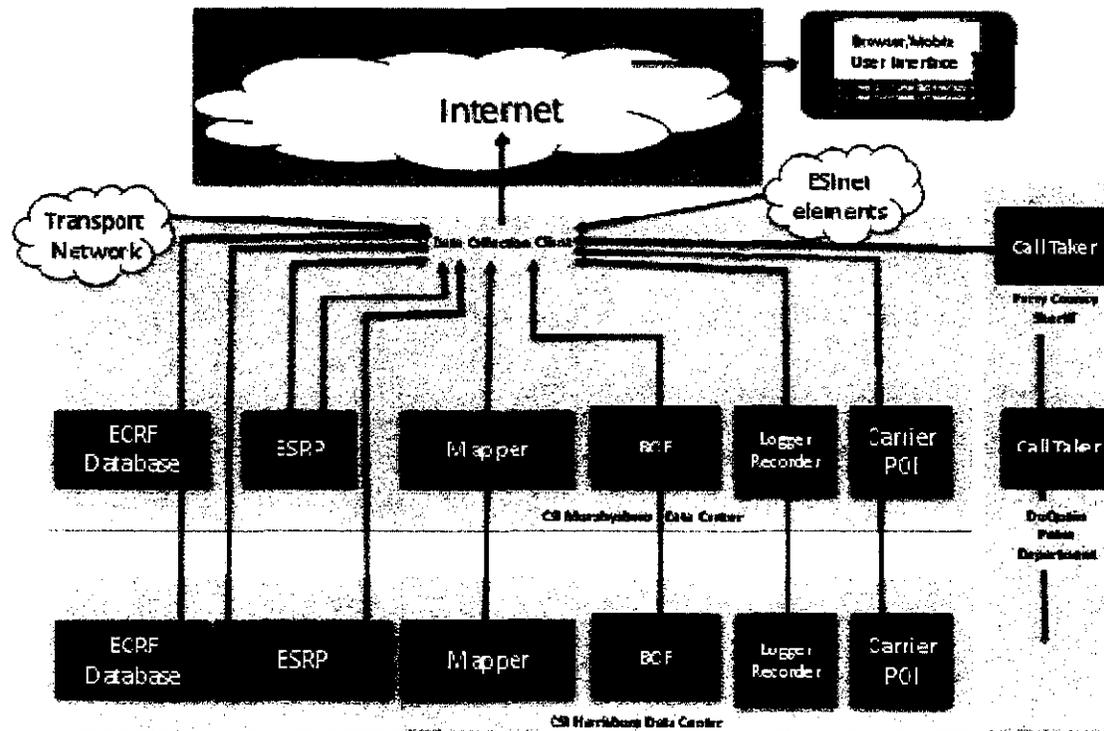
The following test cases support System Performance.

Test Case #	Test Description	Expected Test Outcome Notes	Results/Dates/Initials
NG-SP-001*	Test the ability of the system to support automated, unassisted restoration from stoppages or outages, including significant network components and application software.		
NG-SP-002*	Test the ability of the system to provide positive/affirmative alert to each call taker position of off-line status, error conditions or conditional events.		
NG-SP-003*	Test the ability of the system to support localized supervision and reporting of ANI and ALI failures, network outages, etc.		
NG-SP-004*	Test the ability of the system to provide in each PSAP readily visible and (selectable) audible indicators of emergency and non-emergency calls pending.	Call will ring differently for each type of call – 911 or Admin.	911 call ring like a siren and admin calls like a digital phone rings. March 2012
NG-SP-005* **	Validate that the vendor has described their recommended approach to node and link redundancy to meet Availability Performance Requirements.	Node and Links are redundant	Node and Link redundancy verified February 2012
NG-SP-006* **	Validate that the vendor(s) described their system architecture as it relates to failover and fault tolerance, including the gateway into the 9-1-1 IP network, traffic paths to the network endpoints, and any crucial devices within the scope of the relevant network fabric.		Testing in progress

2.11 System Monitoring Test Scenarios – All vendors as required

The following test cases to provide System Monitoring..

Figure 2.11 Monitoring for Testing Union County



1

Test Case #	Test Description	Expected Test Outcome Notes	Results/Dates/Initials
NG-MON-001*	Test that the system can provide error logs and diagnostic information sufficient to support vendor troubleshooting.		

NG-MON-002* **	Test that the system collects sufficient information to give the NG-911, Inc. and IT staff an end-to-end view of the ability of incoming calls to be completed	Includes the use of the Monitoring Application to see the exceptions.	
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2.12 Master Clock Test Scenarios

The following test cases ensure the provision of the Master Clock.

Test Case #	Test Description	Expected Test Outcome Notes	Results/Dates/Initials
NG-MC-001* **	Test to ensure that the master clock subsystem can provide NTP (Network Time Protocol) and SNTP (Simple Network Time Protocol) time synchronization outputs for additional information systems.	Ensure all end to end Master Clock Synchronization Issues are clearly being managed without conflict. Develop a Master Clock diagram for future trouble shooting purposes end to end.	
NG-MC-001-a*	Test to ensure that the master clock subsystem can provide timing to 3 rd party applications.		
NG-MC-001-b*	Test to ensure that the master clock subsystem can provide timing to the Database and Communications Servers		
NG-MC-001-c*	Test to ensure that the master clock subsystem can provide timing to the Logging Recorders		
NG-MC-002*	Test to ensure that the master clock subsystem can provide a time synchronization source to all PSAPs		

3.0 Next Generation 9-1-1 Network Test Cases

NG9-1-1 Network Testing was conducted in the Illinois Institute of Technology (IIT) Real-Time Communications Lab (RTCL). IIT students and mentors had the responsibility to validate the design and configuration of the ESInet and overall NG9-1-1 Architecture based on the real-world NG9-1-1 network being deployed for use by Union County. IIT RTCL configured the lab to match real world conditions, and iteratively identified and tested failure mitigation strategies. IIT Testing and results were provided to Union County via NG-911, Inc. upon completion.

Access Carriers were not involved in the IIT RTCL Testing. NG-911, Inc. will perform these same tests before any Access Carrier enters the Network. Many of these tests can be done once, such as the SIP related tests with an Access Carrier after the basic tests are performed in a simulated fashion and not repeated with each Access Carrier

The Diagram for the IIT RTCL Test Configuration is labeled 3.0.1. The Diagram for the Field NG-911, Inc. Testing is labeled 3.0.2, with associated Tables 3.0.2.1 and 3.0.2.2 respectively.

Section 3.1 describes the results of network tests performed at the Illinois Institute of Technology, (IIT), which determined that key components of the network design functioned in a resilient and secure fashion, and performed well under a simulated load.

Section 3.2 also describes the network tests to be performed and documented by NG-911, Inc. with the Direct Carriers such as Clearwave Communications and the Indirect Carriers using Frontier FAS.

Figure 3.0.1 - Testing at IIT RTCL, Wheaton and Chicago, Illinois

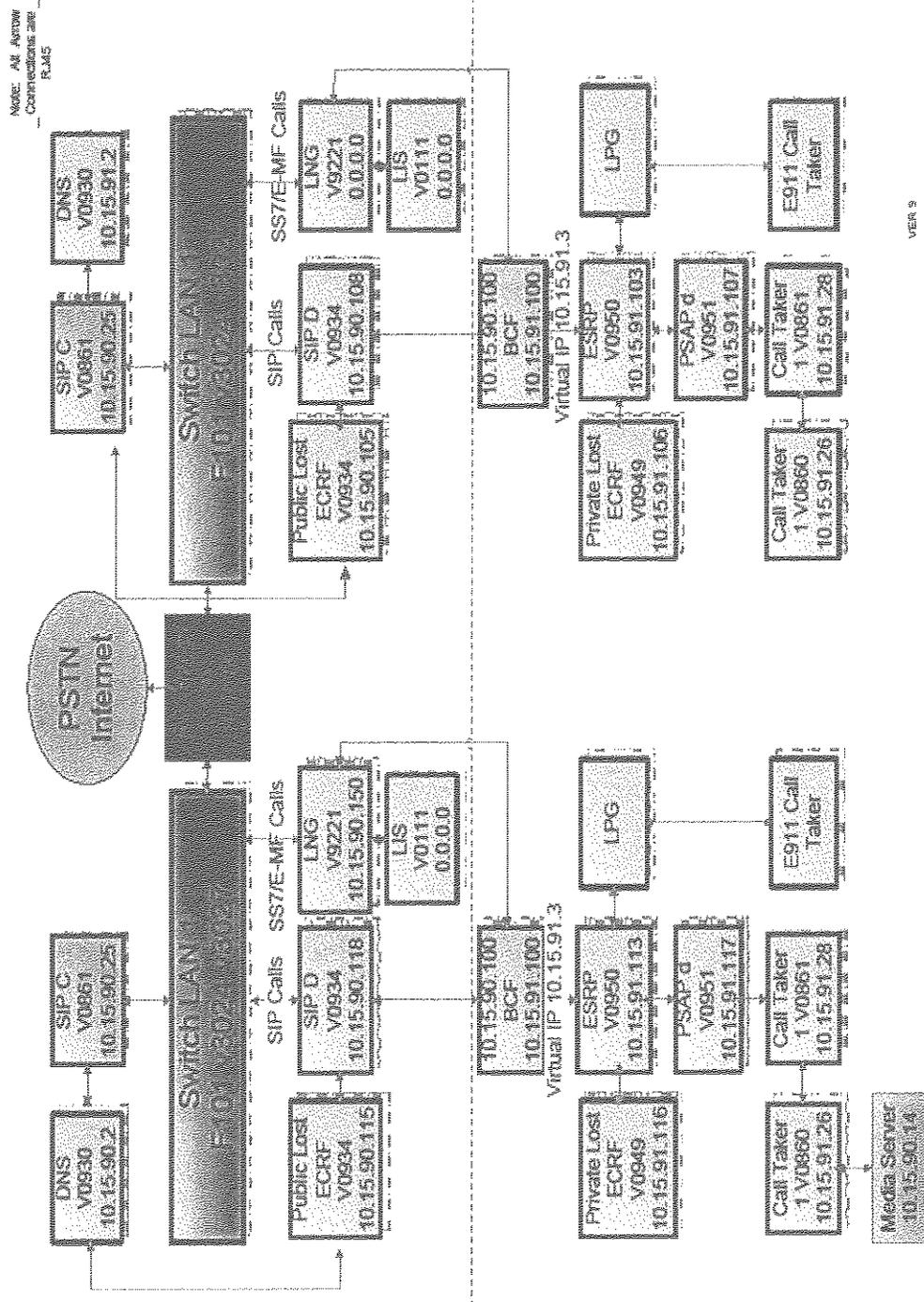


Figure 3.0.2 – NG9-1-1, Inc. Testing Configuration

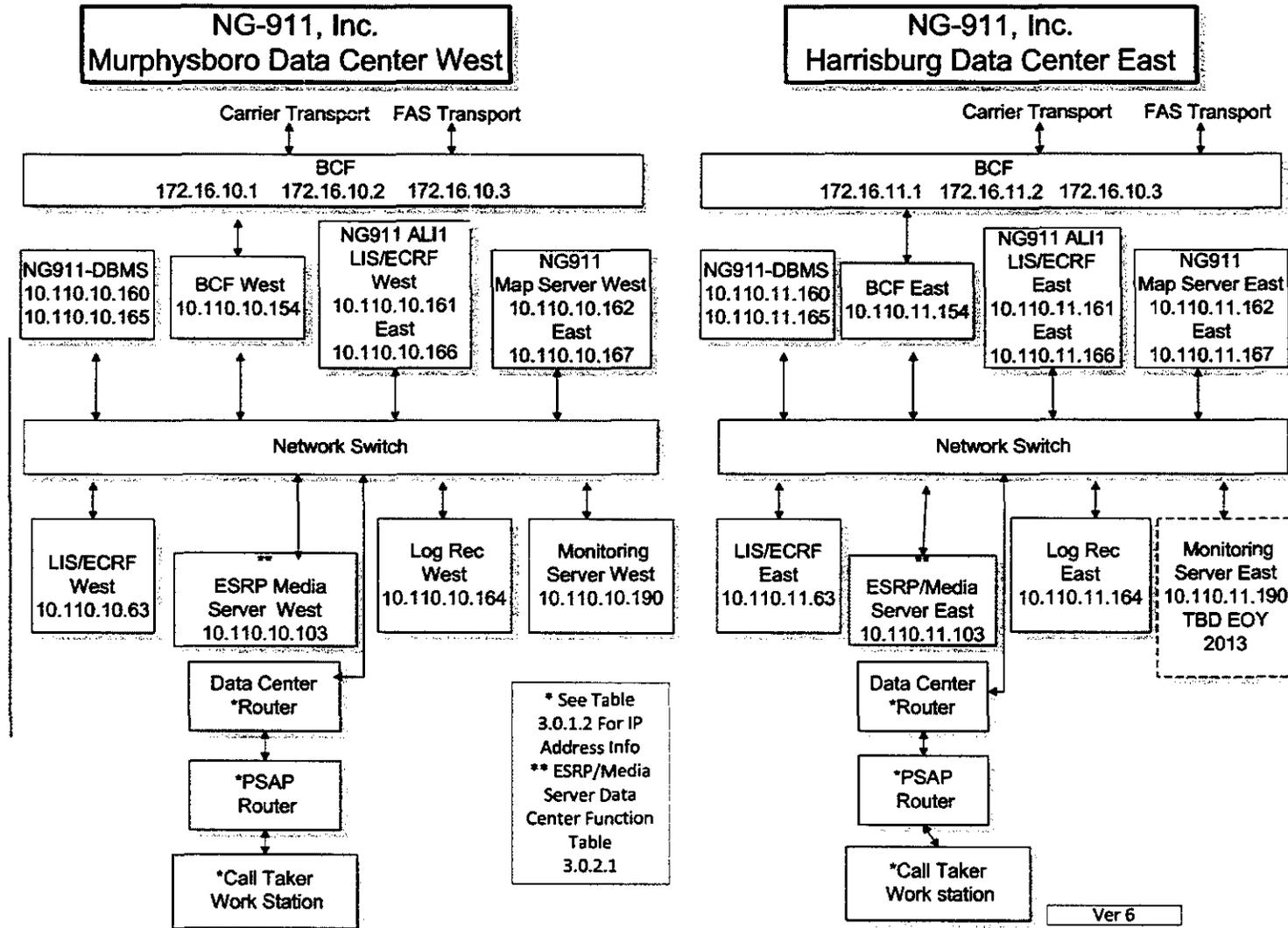


Table 3.0.2.1 - Data Center - related to Figure 3.0.2 above**

Data Center	Functions	IP Addresses
West	Legacy Network Gateway (LNG)	10.110.10.103
	SIPc	
	ESRP	
	Media Server	
	Legacy PSAP Gateway (LPG)	
Data Center	Functions	IP Addresses
East	Legacy Network Gateway (LNG)	10.110.11.103
	SIPc	
	ESRP	
	Media Server	
	Legacy PSAP Gateway (LPG)	

Table 3.0.2.2 - PSAP Information Table Supplement to Figure 3.0.2.1 above

PSAP Number County	PSAP Name	Work Stations	Work Station IP Addresses	Router /PSAP	IP Address /Router
1 Union	Union County Sheriff	3	10.110.44.30 10.110.44.31 10.110.11.32	1	10.110.44.254

IIT RTCL

The functions of the NG9-1-1 Network Design that were tested at the IIT RTCL Lab are:

1. Resiliency to Network Element failures, and failures of layer 1 and layer 2 transport systems.
2. Performance of the design under heavy load conditions.
3. Security of information and security from attacks that affect performance.

Network Testing: Given the agreements with the FAS Frontier INdigital solution, additional testing will be provided through FAS Network to Network. The configuration for FAS and NG 9-1-1 and ESInet Testing required is included in the Diagrams.

Access Testing: Indirect Access Carrier testing will be performed by NG-911, Inc., in cooperation with Frontier including the Indirect Access Carriers. Refer to the Exhibit 10.2 FAS Test Plan for testing of Indirect Access Carriers.

3.1.1 Resiliency Test Plan - IIT RTCL

This set of tables reflects the tests and the documented results from the IIT RTCL Testing.

Test Case #	Test Description	Expected Test Outcome	Results
IIT-001	Place 911 test call from SIP UA and remove power from the ESRP IP address 10.15.91.113 Place 2 nd test call and record both results	911 call is routed to the alternate ESRP IP address 10.15.91.103 via Virtual IP address 10.15.91.3	911 call is routed to the alternate ESRP IP address 10.15.91.103 via Virtual IP address 10.15.91.3
IIT-002	Place 911 test call from SIP UA and remove the RJ45 connection from ESRP to Switch 101 v3024 IP address 10.15.91.113 Place 2 nd test call and record both results	911 call is routed to the alternate ESRP IP address 10.15.90.103 via Virtual IP address 10.15.90.3	911 call is routed to the alternate ESRP IP address 10.15.91.103 via Virtual IP address 10.15.91.3
IIT-003	Place 911 test call from SIP UA and remove power from the PSAP IP address 10.15.91.117 Place 2 nd test call and record both results	911 call is routed to alternate PSAP IP address 10.15.90.107 via Virtual IP address 10.15.91.7	911 call is routed to alternate PSAP IP address 10.15.91.107 via Virtual IP address 10.15.91.7 Call Takers have to re-register to alternate PSAP after failover
IIT-004	Place 911 test call from SIP UA and remove the RJ45 connection from PSAP to Switch 101 v3024 IP address 10.15.91.117 and record both results	911 call is routed to alternate PSAP IP address 10.15.91.107 via Virtual IP address 10.15.9.7	911 call is routed to alternate PSAP IP address 10.15.91.107 via Virtual IP address 10.15.91.7 Call Takers have to re-register to alternate PSAP after failover
IIT-005	Place 911 test call from SIP UA and remove power from Call taker 1 IP Address 10.15.9.26 Place 2 nd test call and record both results	The 911 call is routed to the 2 nd Call Taker 10.15.91.28	The 2 nd 911 test call is received by the 2 nd call taker and the 3 rd call routes to Queue
IIT-006	Place 911 Test call from SIP UA and remove RJ 45 connection from Call taker position to Switch 101 v0324 Place 2 nd test call and record both results	911 call is routed to alternate Call Taker 10.15.91.28	The 2 nd 911 test call is received by the 2 nd call taker and the 3 rd call routes to Queue
IIT-007	Place 911 CAMA/MF test call from the 314A CAMA test set and removes power from the ESRP.	911 Call is routed to the alternate ESI net	CAMA/MF 911 Call Routes to Alternate ESRP after power is removed from Primary ESRP

	Place 2 nd test call and record both results		
IIT-008	Place 911 CAMA/MF test call from the 314A CAMA test Set and remove the RJ45 connection from the ESRP Place 2 nd test call and record both results	911 call is routed to the Alternate ESInet	CAMA/MF 911 Call Routes to Alternate ESRP after the ESRP loses connectivity to the Network
IIT-009	Test case reserved for future testing.		
IIT-010	Test case reserved for future testing.		
IIT-011	Place 911 Test call with manual location set and remove power to the private lost server ECRF function IP address 10.15.91.116 Place 2 nd test call and record both results	911 call is routed to the alternate private lost server IP Address 10.15.91.106 via Virtual IP address 10.15.91.6 but the alternate private LOST location information will be used to forward the call instead.	911 call is routed to the alternate private lost server IP Address 10.15.91.106 via Virtual IP address 10.15.91.6 but the alternate private LOST location information will be used to forward the call instead.
IIT-012	Place 911 test call with manual location set and remove the RJ45 connection to the private lost server ECRF function IP address 10.15.91.116 Place 2 nd test call and record both results	911 call is routed to the alternate private lost server IP Address 10.15.91.106 via Virtual IP address 10.15.91.6 but alternate private LOST location information will be used to forward the call instead.	911 call is routed to the alternate private lost server IP Address 10.15.91.106 via Virtual IP address 10.15.90.6 but alternate private LOST location information will be used to forward the call instead.

3.1.2 Resiliency Test Plan – NG-911

This set of tables reflect the tests and the documented results from Field Testing

Test Case #	Test Description	Expected Test Outcome	Results/Dates/Initials
NG-001* **	Place 911 test call from SIP UA and remove power from the ESRP IP address Place 2 nd test call and record both results	911 call is routed to the alternate ESRP IP address via Virtual IP address	
NG-002* **	Place 911 test call from SIP UA and remove the RJ45 connection from ESRP to Switch IP address Place 2 nd test call and record both results	911 call is routed to the alternate ESRP IP address via Virtual IP address	

NG-003* **	Place 911 test call from SIP UA and remove power from the PSAP IP address Place 2 nd test call and record both results	911 call is routed to alternate PSAP IP address via Virtual IP address	
NG-004* **	Place 911 test call from SIP UA and remove the RJ45 connection from PSAP to Switch IP address and record both results	911 call is routed to alternate PSAP IP address via Virtual IP address	
NG-005* **	Place 911 test call from SIP UA and remove power from Call taker 1 IP Address 10.15.9.26 Place 2 nd test call and record both results	The 911 call is routed to the 2 nd Call Taker	
NG-006* **	Place 911 Test call from SIP UA and remove RJ 45 connection from Call taker position to Switch Place 2 nd test call and record both results	911 call is routed to alternate Call Taker	

3.2 Security Test Plan

Section 3.2.1 includes the IIT RTCL Security Tests and Results.

Section 3.2.2 includes the Security Tests.

3.2.1 Security - IIT RTCL

Test Case #	Test Description	Expected Test Outcome	Results
IIT-013	Access LNG using Telnet or SSH to IP Address 64.131.109.217	Access to the LNG management port is allowed for Authorized IP addresses	Access to LNG is allowed to IP address 64.131.109.217
IIT-014	Login to LNG with Root Login and Non-authorized Password	Access is denied except for users with authorized passwords	Access is Denied to users without the proper credentials
IIT-015	Login to LNG using non-authorized login and Password	Access is denied except for users with authorized logins and passwords	Access is Denied to users without The proper credentials
IIT-016	Login to LNG using authorized login and	Access is allowed with Authorized	Access is allowed with Authorized

	password	Logins and Passwords	Logins and Passwords.
IIT-017	Restrict Access to the BCF and ESInet from outside the network by denying access to other than authorized IP addresses.	Access BCF from outside the network using Non-Authorized IP Address.	An Access control list was created for Authorized IP address access. Attempts to access the BCF from non-authorized IP addresses are refused.
IIT-018	Login to BCF Management port using non-authorized logins and passwords	Access is Denied for non-authorized users	Access is not allowed when attempting to access the BCF Management port
IIT-019	Allow Authorized Access to management port of the BCF	Users with non-Authorized Logins and passwords are denied access to the BCF Management port	Non Authorized users are denied. Only users listed in the SSH file are allowed
IIT-020	Restrict user privileges in the BCF on a per user login and password basis	Authorized users are restricted to their allowed access privileges	BCF Commands are restricted by assigned user privileges.
IIT-021	Call Taker/PSAP initiates outbound SIP call	Call completes from PSAP	Call completes to an available call taker when an outbound call is initiated.
IIT-022	PSAP/ Call Takers attempt to access Internet	Call takers cannot complete to the Internet	A call taker cannot complete to the internet when access is attempted
IIT-023	Allow normal inbound SIP call traffic and block unauthorized SIP sessions	SIP traffic allowed for trusted IP addresses only	Normal inbound SIP call traffic allowed and unauthorized SIP sessions blocked

3.2.2 Security - NG-911

Test Case #	Test Description	Expected Test Outcome	Results/Dates/Initials
NG-017* **	Restrict Access to the BCF and ESInet from outside the network by denying access to other than authorized IP addresses.	Access BCF from outside the network using Non-Authorized IP Address.	BCF locked down and tested with Clearwave May 2013
NG-018* **	Login to BCF Management port using non-authorized logins and passwords	Access is Denied for non-authorized users	Tested only allows authorized users to log in May 2013

NG-019* **	Allow Authorized Access to management port of the BCF	Users with non-Authorized Logins and passwords are denied access to the BCF Management port	Tested only allows authorized users to log in May 2013
NG-020* **	Restrict user privileges in the BCF on a per user login and password basis	Authorized users are restricted to their allowed access privileges	Tested only allows authorized access and privileges based log in May 2013
NG-021* **	Call Taker/PSAP initiates outbound SIP call	Call completes from PSAP	
NG-022*	PSAP/ Call Takers attempt to access Internet	Call takers cannot complete to the Internet	Tested ability to deny call taker access to the internet and allows access for updates. May 2013
NG-023* **	Allow normal inbound SIP call traffic and block unauthorized SIP sessions	SIP traffic allowed for trusted IP addresses only	

3.3 Performance Test Plan

3.3.1 Performance Test Plan and Results – IIT RTCL

Test Case #	Test Description	Expected Test Outcome	Results
IIT-024	Generate multiple SIP test calls to the ESInet and observe performance.	SBC should forward all SIP Calls to the PSAP Call Takers	All Calls are sent to the available call takers
IIT-025	Generate Multiple SIP calls to the Session Boarder Controller (SBC)	SBC should forward all SIP Calls to the PSAP Call Takers	All Calls are sent to the available call takers
IIT-026	Generate Multiple test Calls to the Call taker positions until all are busy	Calls should Queue and release as positions become available	All calls Queue when available call takers are busy.
IIT-027	Verify the ability of the Call Taker to transfer a call to another PSAP	Call Taker successfully transfers A call	A call taker successfully transferred a call to a 3 rd call taker
IIT-028	Generate Multiple invite messages to the ESRP and observe performance.	The ESRP should accept all invites until limits are reached.	The ESRP accepted approx. 16000 invite messages and then reached a Q full status. Rebooted ESRP as a result of failure
IIT-029	Generate Multiple Invite messages to the SBC and ESInet to simulate a DDoS attack and then observe performance.	The SBC should accept all invite messages until failure. The SBC is not configured to prevent a	The SBC forwarded approx. 16000 invite messages from the MU-8000 to the ESInet and then generated

		DDoS attack during this test	503 server busy and 408 timeout messages. Rebooted BCF as a result of failure
IIT-030	Generate registrations without authorization to Call takers	The Call takers should register to PSAP.	62000 registrations were generated by the MU-8000. 40,000 passed with 22,000 errors Rebooted PSAP
IIT-031	Generate Multiple Invite messages to the SBC and ESInet to simulate a DDoS attack with the SBC configured to throttle requests	The SBC should allow multiple invite request based on the programmed parameters of the SBC	Multiple Invite messages generated to the SBC and ESInet simulates a DDoS attack with the SBC configured to throttle requests

3.3.2 Field Performance Test Plan and Results – NG-911

In the case of the NG-911, Inc. Performance Testing, if assistance is needed to generate the call volume, one choice would be to locate DDoS attack software or use IIT RTCL suggested software. Another major objective is to recognize when a DDoS or TDoS attack is taking place and to escalate, and advise others per Policy or Regulatory Requirements.

Test Case #	Test Description	Expected Test Outcome	Results/Dates/Initials
NG-024* **	Generate multiple SIP test calls to the ESInet and observe performance.	SBC should forward all SIP Calls to the PSAP Call Takers	
NG-025* **	Generate Multiple SIP calls to the Session Boarder Controller (SBC)	SBC should forward all SIP Calls to the PSAP Call Takers	
NG-026* **	Generate Multiple test Calls to the Call taker positions until all are busy	Calls should Queue and release as positions become available	
NG-027* **	Verify the ability of the Call Taker to transfer a call to another PSAP	Call Taker successfully transfers A call	
NG-028* **	Generate Multiple invite messages to the ESRP and observe performance.	The ESRP should accept all invites until limits are reached.	
NG-029* **	Generate Multiple Invite messages to the SBC and ESInet to simulate a DDoS attack and then observe performance.	The SBC should accept all invite messages until failure. The SBC is not configured to prevent a DDoS attack during this test	

NG-030* **	Generate registrations without authorization to Call takers	The Call takers should register to PSAP.	
NG-031* **	Generate Multiple Invite messages to the SBC and ESInet to simulate a DDoS attack with the SBC configured to throttle requests	The SBC should allow multiple invite request based on the programmed parameters of the SBC	

4.0 Additional Testing

The test cases ensure that, call through and field testing has been performed .

Test Case #	Test Description	Expected Test Outcome Notes	Results/Dates/Initials
V-000* **	Perform Call Through Testing for NXXs, Carrier, and PSAP combinations shown on the table below. Ensure each Class of Service is Tested in each Rate Center in each Originating Location. (see Templates in appendices)	No new Carriers, trunks or numbers are changed in Phase 1; only Clearwave and or any other Direct carrier need be tested to this extent. See the Exhibit 10.2 FAS Test Plan	
V-001	Split Exchange Testing Direct	The Narrative and the ETSB Network Diagrams include Split Exchanges to be and tested for call completion to the correct PSAPs each time using Clearwave SIP Connectivity Insert as needed.	

V-002	Split Exchange Testing Indirect via FAS	The Narrative Plan has a table and reference to the ETSB Diagram to reflect the Split Exchanges to be tested for call completion to the correct PSAPs each time using FAS	
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Appendix A - Standards Report Resolution Template

Standards Clarification/Resolution Request - NG-911, Inc.						
Item	Date	Trouble Ticket(s)	Vendor(s)	Compliance Clarification Request	Standard Name/ Section	Resolution Y/N
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
n						

Appendix B - General Trouble Report Resolution Template

Trouble Resolution Request - NG-911, Inc.							Commission
Item	Date Time Open	Trouble Ticket(s)	Vendor(s)	Brief Description of Trouble	Severity Level	Resolution Y/N Date Closed	Commission Report Y/N/NA and which Commission
1							
2							
3							
4							
5							
6							
7							
8							
9							
n							

1. During Pre-Cutover Testing, the Trouble Resolution timeframe will be agreed upon by all parties before the start of the testing process.
2. After Cutover to live service, the Trouble Resolution timeframe will be agreed upon based on Severity Level , Service Level Agreements (SLAs) including an Escalation Policy.
3. Trouble Report filing to the Commissions will be governed by the Commission requirements. NG 9-1-1, Inc. will follow ICC and FCC guidelines as they pertain to the 911 SSP for Trouble Reports.

Appendix C - End to End Testing Template

Carrier – Transport Vendor - NG-911, Inc. – Data Center (DC) - ESInet Vendor – PSAP - Area Code: 618																		
Item	Date Time	Carrier Name/ Type	Carrier Orig Contact/ Number	Carrier NOC /Number	NXX	Class Svc	Split Y/N	Dir/ FAS/ SR	INd C	INd H	DC M/H	E S I net Y/N	PRI PSA P	Alt 2	Alt 3	Alt 4	Transfer Y/N	P/F
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
n																		

Convert for field use to an Excel Spreadsheet

Appendix D - Carrier Test Numbers for NPA NXXs Template

Test Numbers: Per County Per Carrier Per NPA NXX, Per line Number – into FTR DB and NG DB																		
ETSB	CARRIER	SWITCH CLLI	NPA	NXX	RC NAME ABB	CARRIER TYPE	SWITCH TYPE	SPLIT EXCH	SPLIT W ETSBs:	FROM	TO	LERG TEST #	CARRIER TEST #	FTR DB	NG DB	PRI PSAP	Tested	P/F
Union	Frontier	CBDNILXERSO	618	893	Cobden	I LEC		Y		1000	9999	None						
Union	Frontier	CBDNILXERSO	618	893	Cobden	C LEC		Y		1000	1999	None						
Union	Frontier	CBDNILXERSO	618	893	Cobden	C LEC		Y		2000	2999	None						
Union	Frontier	CBDNILXERSO	618	893	Cobden	C LEC		Y		4000	4999	None						