NDSU | UPPER GREAT PLAINS TRANSPORTATION INSTITUTE
ADVANCED TRAFFIC ANALYSIS CENTER

# *Grand Forks Data Collection and Archival Study – Phase I*

Final Report

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Prepared for:
Grand Forks-East Grand Forks MPO

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## Background

The Grand Forks – East Grand Forks MPO contacted ATAC with regards to using the existing traffic detection cameras for traffic data collection and archival. The intersections included in this Grand Forks Data Collection and Archival Study – Phase I are listed in table 1. Table 1 also shows the number of lanes at each of the intersections where detectors, detector stations, and detector functions would need to be created on per lane basis.

Table 1. List of intersections

| # | Main Street | Cross Street | Total Lanes |
|---|---|---|---|
| 1 | Gateway Drive | NB I-29 Ramps | 9 |
| 2 | Gateway Drive | N 42nd St | 13 |
| 3 | Gateway Drive | Stanford Rd | 10 |
| 4 | Gateway Drive | N Columbia Rd | 13 |
| 5 | Gateway Drive | N 20th St | 9 |
| 6 | Gateway Drive | N Washington St | 16 |
| 7 | Gateway Drive | State Mill Rd | 11 |
| 8 | Gateway Drive | N 3rd St | 9 |
| 9 | N 5th St | 5th Ave N | 4 |
| 10 | N 5th St | University Ave | 6 |
| 11 | N 5th St | 2nd Ave N | 4 |
| 12 | N 5th St | 1st Ave N | 7 |
| 13 | N 5th St | Demers Ave | 12 |
| 14 | S 5th St | Kittson Ave | 6 |
| 15 | 32nd Ave S | S 38th St | 14 |
| 16 | 32nd Ave S | S 34th St | 13 |
| 17 | 32nd Ave S | S 31st St | 14 |
| 18 | 32nd Ave S | S Columbia Rd | 18 |
| 19 | 32nd Ave S | S 20th St | 12 |
| 20* | 32nd Ave S | S Washington St | 16 |
| 21 | N Columbia Rd | University Ave | 13 |
| 22 | S Columbia Rd | 24th Ave S | 14 |
| 23 | S Columbia Rd | 28th Ave S | 14 |
| 24 | S Washington St | 13th Ave S | 10 |
| 25 | S Washington St | 40th Ave S | 8 |
| 26 | S 42nd St | Garden View Drive | 11 |
| 27 | 17th Ave S | S 34th St | 10 |
| 28 | 24th Ave S | S 20th St | 8 |
| 29 | Demers Ave | N 4th St | 10 |
| 30 | Demers Ave | N 3rd St | 10 |

*Sample Intersection

## Sample Intersection Setup

The intersection of 32nd Ave S and S Washington St was setup as a sample during this study. This location was selected as it is located on the intersection of two principal arterials. In addition, this intersection has exclusive left- and right-turn lanes and the camera calibration was found to be acceptable, which facilitates the setup of detectors. Figure 1 shows a combination picture of all four approaches at the intersection with the detectors and detector functions as they were setup for Phase I of this study. The setup is expected to be maintained for Phase II.

## Remote Access to Communications Server

For the purpose of Phase I of this study, remote access to the Communications Server was provided courtesy of the City of Grand Forks. The remote access setup was through a third party and utilized internet explorer. Due to limited functionality of such setup, various shortcomings were noticed which included inability to transfer data to ATAC network, lag of video in video player application, some lag in sending commands to the server, user being kicked off of the server etc. Additionally, the remote access credentials provided to ATAC expired on Jan 28, 2014. These shortcomings were worked around during Phase I as only 1 intersection was to be setup as a sample. This remote access setup will not be adequate for setting up detection at the city's 30 intersections; the extra time required to work around the limitations would increase the cost of Phase II of the project. Finally, web based remote access would not support the automation of data retrieval by ATAC for processing and archival. Therefore, for Phase II of the project, a more direct setup would be required. It is recommended that a direct access to the Communications Server be setup through Autoscope Network Browser. Autoscope Network Browser is the program utilized in setting up of all detectors and detector functions. A setup through this program would not only be secure but would also prevent the user from being kicked off of the server due to login attempts by another agency.

If the use of Autoscope Network Browser is not possible, a more robust remote access method would be needed. There are several solutions available including utilizing Windows built in remote access functionality. An investigation of a method that has the functionality needed by ATAC and acceptable to the city of Grand Forks is needed.

After setting up detection on the identified intersections is completed, remote access will still be needed for the transfer of the collected data to ATAC for processing and analysis. There are several solution that can be pursued to achieve this including setting up a file server at the Grand Forks signal shop that is accessible by ATAC. The IT departments both at the city of Grand Forks and at NDSU will likely need to be involved in these remote access and data transfer discussions.

## Relationship to ITS Services

Implementing a data collection and archival system will have a direct impact on improving several ITS services that are identified in the GF-EGF MPO Regional ITS Architecture. Namely ITS services in Network Surveillance; Signal Control; and Traffic Information Dissemination will benefit of such system that will provide accurate and timely traffic count data. In addition to the above services, the system would serve as a nucleus for implementing ITS Data Management for the GF-EGF region, which when combined with data streams from other service areas such as Emergency Management, Maintenance and Construction, and Transit, would form a fully implemented ITS Data Warehouse.

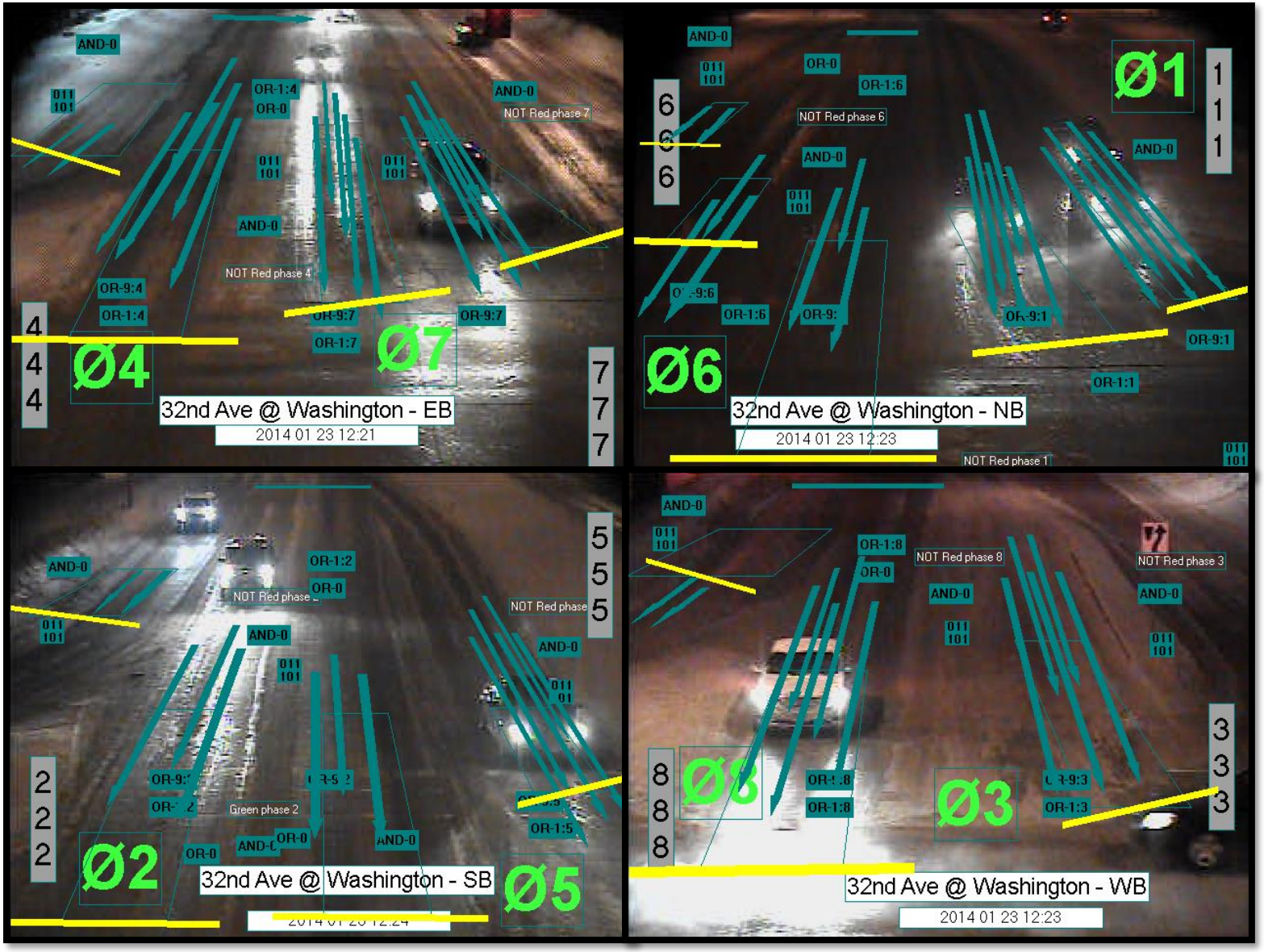


Figure 1. Combination screenshot showing detector setup at the intersection of S 32nd Ave and S Washington St

## Data Accuracy

Random checks were performed and traffic volumes were collected manually in 15-minute intervals at each of the approaches. A comparison of the traffic volumes is shown in table 2.

Table 2. Volume comparison between Autoscope and Manual Turning Movement Counts

| 32nd Ave S and S Washington St | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Interval | Source | Southbound Washington | | | | Westbound 32nd Ave | | | | Northbound Washington | | | | Eastbound 32nd Ave | | | |
| | | Right | Thru | Left | Total | Right | Thru | Left | Total | Right | Thru | Left | Total | Right | Thru | Left | Total |
| 15-min interval | Manual | 21 | 53 | 6 | 80 | 60 | 58 | 12 | 130 | 1 | 62 | 24 | 87 | 48 | 73 | 109 | 230 |
| | Autoscope | 21 | 52 | 7 | 80 | 62 | 58 | 17 | 137 | 2 | 61 | 25 | 88 | 42 | 76 | 98 | 216 |
| 15-min interval | Manual | - | - | - | - | 69 | 86 | 16 | 171 | 5 | 75 | 19 | 99 | - | - | - | - |
| | Autoscope | - | - | - | - | 62 | 90 | 14 | 166 | 5 | 76 | 23 | 104 | - | - | - | - |
| 15-min interval | Manual | - | - | - | - | 76 | 85 | 17 | 178 | 6 | 60 | 35 | 101 | - | - | - | - |
| | Autoscope | - | - | - | - | 73 | 82 | 17 | 172 | 5 | 55 | 40 | 100 | - | - | - | - |
| 15-min interval | Manual | - | - | - | - | 82 | 68 | 13 | 163 | 4 | 50 | 23 | 77 | - | - | - | - |
| | Autoscope | - | - | - | - | 75 | 71 | 11 | 157 | 6 | 48 | 27 | 81 | - | - | - | - |
| Hourly Totals | Manual | 21 | 53 | 6 | 80 | 287 | 297 | 58 | 642 | 16 | 247 | 101 | 364 | 48 | 73 | 109 | 230 |
| | Autoscope | 21 | 52 | 7 | 80 | 272 | 301 | 59 | 632 | 18 | 240 | 115 | 373 | 42 | 76 | 98 | 216 |
| | Difference | **0%** | **-2%** | **17%** | **0%** | **-5%** | **1%** | **2%** | **-2%** | **13%** | **-3%** | **14%** | **2%** | **-13%** | **4%** | **-10%** | **-6%** |

## Conclusion

The above comparison shows that the output from cameras is within 10% when comparing approach totals and within 15% when comparing individual turning movement totals at an intersection with exclusive right- and left- turn lanes. The highest percentage differences typically occurred at movements with low volume. These results indicate that acceptable turning movement count results can be obtained from cameras primarily setup for traffic detection in Grand Forks.

Note that results from other locations may vary depending on calibration, viewpoint, mounting location, lighting conditions, intersection geometrics, and other factors.

## Phase II – Next Steps

Phase II of this study would first entail remote access setup, followed by turning movement count data collection setup and data processing and archival setup. The following section lists the major tasks of Phase II.

## Phase II Tasks

The tasks for Phase II of the project are divided into two categories:

1. Data Collection Setup – would entail the following tasks:
    - Detector Setup
        - Setup of Speed Detectors
        - Setup of Count Detectors
        - Setup of Detector Stations
    - Detector Function Setup
        - Setup of detector functions such as NAND, AND, OR etc.
    - Data Quality Audits
    - Fine Tuning/Recalibration
        - Re-setup of detectors and/or detector functions as necessary
        - Recommend alternate camera placement, if necessary
        - Recommend re-calibration of camera(s), if necessary
    - Result Presentation
        - Compare manual counts to camera output

2. Data Processing and Archival – would entail the following tasks:
    - Data Download
        - Transfer of data from cameras to communications server
    - Data Transfer
        - Transfer of data from communications sever to ATAC server
    - Software Development
        - Develop software to arrange camera output to desired format and concatenate/append continuous time intervals from different files
        - Develop software to use camera output to create tables, charts showing:
            - AADT (Intersection/Approach)
            - MADT (Intersection/Approach)
            - Intersection Turning Movement Counts
                - Peak Hour Counts (AM/Mid-Day/PM)
                - Weekly Counts (Weekly/Weekday/Weekend)
                - Special Event (Customized time frame)
            - Day-of-the-week Factors
            - Seasonal Factors etc.
    - Data Archival
        - Setup of data storage and archival