Mill Seat Landfill Expansion Facility ID No. 8-2648-00014 Town of Riga, New York

Draft Supplemental Environmental Impact Statement

Attachment I

Traffic Report





Mill Seat Landfill Expansion Facility ID No. 8-2648-00014

Town of Riga, New York

Traffic Report



November 2014



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GLOSSARY OF TERMS

B&L - Barton & Loguidice

BUD – Beneficial Use Determination

County - Monroe County, New York.

Disposal Capacity – The amount of capacity available in the solid waste management facility available for the disposal of waste.

Landfill Lease Agreement – The Agreement by and between Monroe County, New York (Lessor) and WMNY (Lessee) dated January 14, 2002 and any Amendments thereafter.

Lessee – In an agreement between Monroe County, New York and WMNY, WMNY took responsibility for landfill operations for a 49-year period. WMNY operates the landfill on behalf of Monroe County.

LOS - Level of Service

Mill Seat Landfill – Currently permitted landfill and associated operations.

NYSDEC - New York State Department of Environmental Conservation.

NYSDOT – New York State Department of Transportation

Owner - Monroe County is the owner of the Mill Seat Landfill.

6 NYCRR Part 360 – NYSDEC's solid waste management regulations, codified at 6 NYCRR Part 360 (Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York), effective May 12, 2006.

Permitted Footprint – The existing 98.6 acres of the Permitted Site allocated for solid waste disposal within a double composite liner system.

Permitted Site – The land on which the Permitted Footprint and associated support features (including a Maintenance Building, Administration Building, Scale House, LFG collection system, leachate collection and storage facility, stormwater management features, access roadways, two (2) soil borrow areas and a LFGTE Facility) is located, and the land included as part of the Landfill Lease Agreement. The Permitted Site totals 485 acres.

Permitted Waste Acceptance Rate – The NYSDEC Approved Design Capacity for this landfill is 1,945 tons per day, which equates to 597,000 tons per year. This threshold is a daily average and is based on the quantity of solid wastes accepted at the landfill during a calendar year. Solid wastes that have been approved for use as a beneficial use are not included in this limit.

Proposed Action – The Proposed Landfill Expansion; the proposed wetland impacts and mitigation; the proposed stream impacts and mitigation; as well as required actions, including extension of the Landfill Lease Agreement between Monroe County and WMNY, abandonment of a portion of O'Brien Road and a portion of Brew Road, County and Town of Riga approvals of land transfers, and receipt of noise easements.

Proposed Site – The land on which the Proposed Action would be located, including the 485-acre Permitted Site, the Proposed Wetland Mitigation Area, the O'Brien Road abandonment, and any land acquisitions included in the Proposed Action. The Proposed Site totals approximately 828 acres.

WMNY – Waste Management of New York, LLC operates the Mill Seat Landfill under a lease agreement with Monroe County.

I. <u>EXECUTIVE SUMMARY</u>

A. Overview

The County is the Owner and permittee of the Mill Seat Landfill. The Mill Seat Landfill is operated by WMNY under a Landfill Lease Agreement with the County. The County and WMNY have been community partners for over 20 years. The Mill Seat Landfill's Solid Waste Management Facility NYSDEC Permit I.D. number is 8-2648-00014. The Permitted Site is located in the Town of Riga, Monroe County, New York. The mailing address is 303 Brew Road, Bergen, New York 14416.

The County is seeking a 6 NYCRR Part 360 Solid Waste Management Permit modification from the NYSDEC to construct and operate portions of the Proposed Action. The Proposed Action would allow the Mill Seat Landfill to continue to operate beyond the permitted disposal capacity, providing sufficient capacity to satisfy the community's long-term disposal needs. The Proposed Action is expected to include 118.3 acres of additional lined landfill directly south of the Permitted Footprint, 39.2 acres of overlay on the Permitted Footprint, and approximately 30 acres of disturbance associated with additional support facilities for operation of the Mill Seat Landfill including the stormwater management structures, access roads, LFG collection and control infrastructure, and leachate conveyance infrastructure. Other aspects of this Proposed Action include the proposed wetland impacts and mitigation; the proposed RG-6 Tail impacts and mitigation; as well as required actions, including extension of the Landfill Lease Agreement between the County and WMNY, abandonment of a portion of O'Brien Road, abandonment of a portion of Brew Road, County and Town of Riga approvals of land transfers, and receipt of noise easements. The "Proposed Site", excluding the Proposed Stream Mitigation Area, is the land on which the Proposed Action would be located and includes the Permitted Site.

The purpose of this report is to identify current traffic conditions, compare to previous projections, and forecast future traffic volumes associated with the Proposed Action. This report investigates the existing and future weekday AM and PM peak hour travel conditions at intersections and highway segments surrounding the Mill Seat Landfill. Additionally, this study will evaluate the impacts from construction vehicles for the Proposed Action.

The main haul route for the Mill Seat Landfill includes the use of US I-490, NYS Route 33A, and the north portion of Brew Road between NYS Route 33A and the Mill Seat Landfill. The Mill Seat Landfill entrance is located at the southern terminus of northern Brew Road, approximately three-quarter (0.75) miles south of NYS Route 33A. The O'Brien Road/southern Brew Road entrance is no longer used except for periodic maintenance activities.

The NYSDEC issued the Mill Seat Landfill a 6 NYCRR Part 360 construction permit in 1990 and landfilling operations began in 1993.

II. OBJECTIVE

The objective of this study is to identify current traffic conditions and forecast future traffic volumes and levels of service on the surrounding highway system for the Proposed Action.

III. AFFECTED HIGHWAY SYSTEM

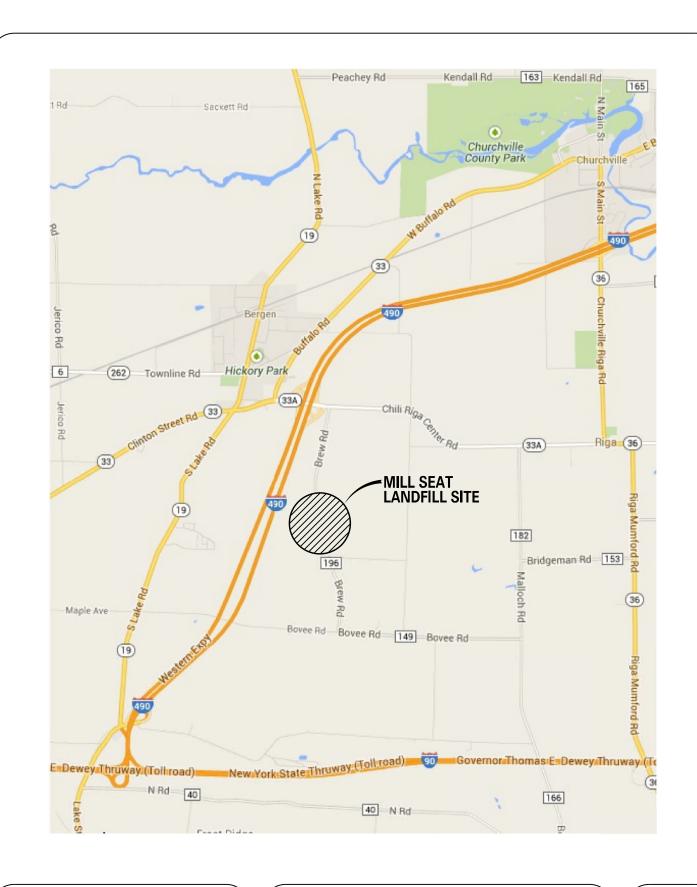
The roadway system identified for investigation includes the portion of Brew Road from the Mill Seat Landfill to Route 33A and Route 33A from Brew Road to I-490. Refer to Figure 1 for the project location map. The intersections of Brew Road with Route 33A as well as the intersections of Route 33A with the I-490 Westbound and Eastbound Off-ramps are included in this analysis.

In the area of the Route 33A interchange, I-490 is functionally classified as a rural principal arterial interstate type highway with full control of access under the jurisdiction of the NYSDOT. The interstate is a divided highway consisting of two (2) travel lanes in each direction with a speed limit of 65 MPH. I-490 provides a major highway connection between the NYS Thruway (I-90) in LeRoy to the west and the City of Rochester to the northeast. The estimated Annual Average Daily Traffic on I-490 between the County Line and the Route 33A interchange was 16,190 vehicles per day in 2010, and approximately 17,380 vehicles per day between the Route 33A interchange and the Route 36 interchange in 2008.

Although it is designated as an east/west route, I-490 actually runs north and south at its intersection with Route 33A to form an expressway interchange. The eastbound off ramp, located on the south side of Route 33A, consists of one lane at its intersection with Route 33A and is controlled by a stop sign. The I-490 westbound off-ramp, located on the north side of Route 33A, consists of a right turn lane controlled by a yield sign and a separate left turn lane controlled by a stop sign. The interchange also supports directional on-ramps (two each), which are not analyzed due to their geometric design. These components are designed as slip ramps without vehicular control which allows continual free-flow movement.

NYS Route 33A is functionally classified as a rural minor arterial from Route 33 to the County line and a rural major collector from the County line to Route 36 under the jurisdiction of the NYSDOT. The highway consists of two (2) travel lanes in each direction in the vicinity of the Proposed Site. The highway narrows to one (1) travel lane per direction to the east of Brew Road. Route 33A provides a highway connection between Route 33 in Rochester to the east and Route 33 near the Town of Bergen to the West. The posted speed limit on Route 33A is 55 MPH in the vicinity of the Proposed Site. The estimated Annual Average Daily Traffic between Route 33 and the County line was 8,640 vehicles per day in 2010, and 2,390 vehicles per day between the County line and Route 36 overlap in 2011.

Brew Road is a north/south County road. In the vicinity of the Route 33A intersection, the highway consists of one (1) travel lane in each direction. The Brew Road intersection with Route 33A is controlled by a stop sign on the minor/side street approach.





MILL SEAT LANDFILL PROJECT LOCATION MAP

TOWN OF RIGA MONROE COUNTY NEW YORK

Figure

1

Project No.

1242.022.013

IV. EXISTING TRAFFIC CONDITIONS

A. Peak Intervals for Analysis

Given the functional characteristics of the study area roadways, the operational characteristics of the Mill Seat Landfill land use, and to be consistent with all previous studies for this Permitted Site, the peak hours selected for analysis are the weekday AM and PM "commuter" peaks. The combination of site traffic and adjacent through traffic produces the greatest demand during these time periods.

B. Existing Peak Hour Volumes

Peak weekday turning movement counts were obtained at the three (3) existing intersections in the study area and are included with this report as Appendix B. The peak hour volumes were determined by turning movement counts including vehicle classification performed by B&L between 6:30-8:30 AM and 3:30-5:30 PM on Wednesday, September 25, 2013. The collected data indicated that during these periods, the peak hours of traffic at the study intersections were generally 7:00-8:00 AM and 3:45-4:45 PM.

Peak hour volumes, depicting the existing vehicular movements at each study intersection, are illustrated in Figures 2 & 3. These figures indicate the total volume of traffic for each movement as well as volume associated with each vehicle type classified during the data collection.

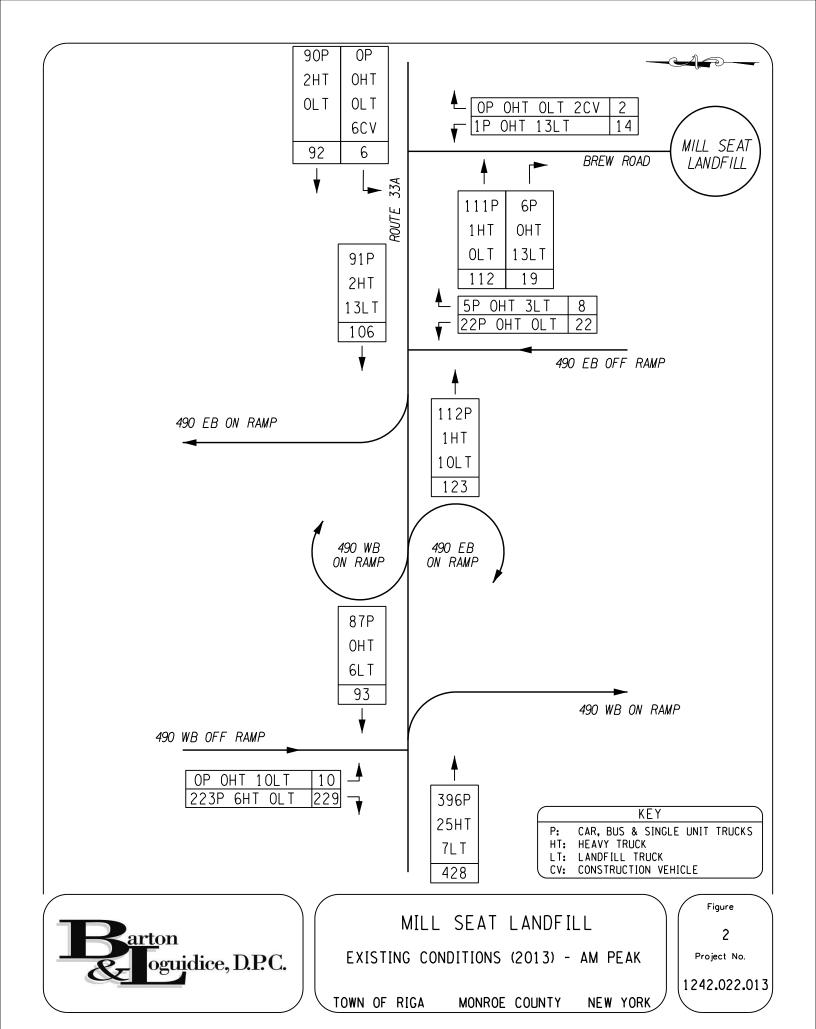
C. Area Growth

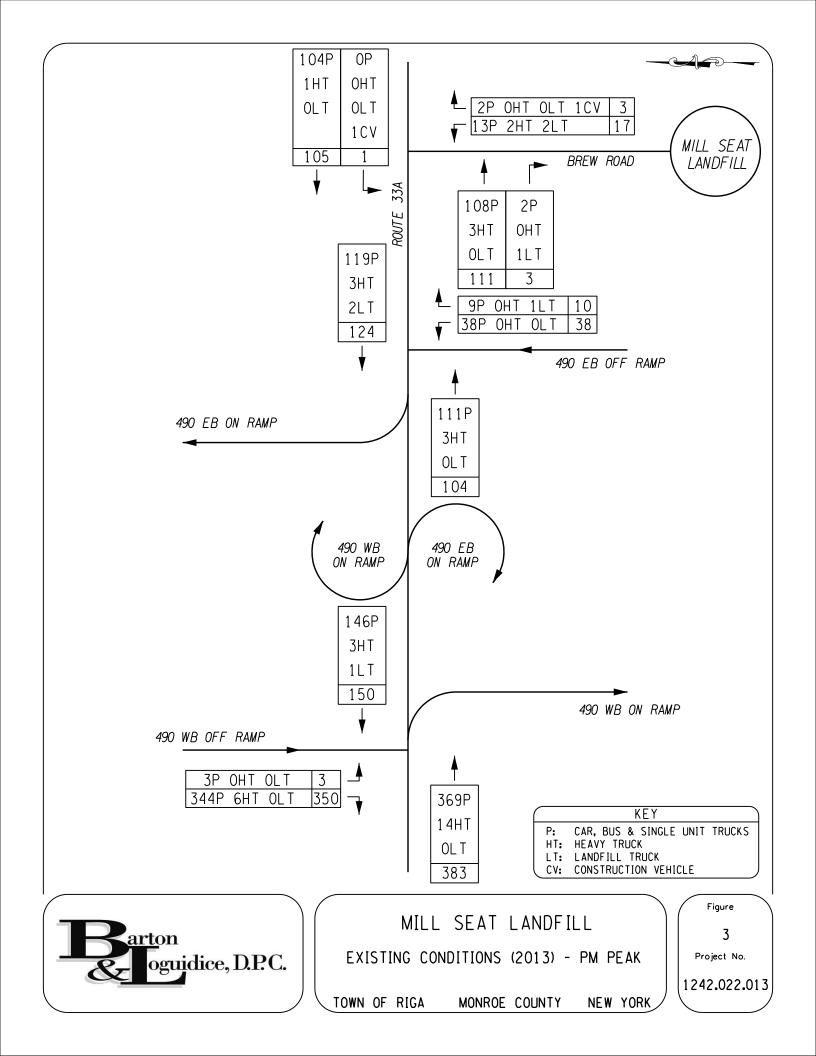
A growth rate of one and a half (1.5) percent per year was applied to all existing traffic volumes that are unrelated to activities at the Mill Seat Landfill to account for potential growth in the area that can be expected from the time the turning movement counts were performed to the opening of the Proposed Action. This rate, recommended by the County, is considered a conservative estimate for short duration growth that can be expected for the Town of Riga. Background traffic is not projected to the life of the Proposed Action as it is growth that may or may not be realized and is unrelated to the Proposed Action or the existing landfill operations. Actual traffic growth over the past 20 years was found to be three-tenths (0.3) percent per year based on NYSDOT Traffic Volume Reports on Route 33A. Historic traffic counts on Route 33A and growth rate calculations are included in Appendix A. Background traffic volumes are shown in Figures 4 and 5.

V. PROPOSED DEVELOPMENT

A. Description

The Proposed Action does not modify the Permitted Waste Acceptance Rate. For the purpose of the traffic analysis, a worst case scenario was analyzed that takes into account the maximum estimated number of trucks combined with the maximum estimated number of construction vehicles anticipated for the Proposed Action.





B. Site Traffic Generation

1. Maximum Operating Volume

Truck ticket data from 2012 was collected and reviewed to identify the peak daily truck volumes for Mill Seat Landfill (See Appendix C). This data indicates that the highest daily truck volume for 2012 was 251 trucks delivering 3,893 tons of material on October 3, 2012. Data provided by Mill Seat Landfill personnel indicates that 524,874 tons of disposal material was delivered to the Mill Seat Landfill in 2012. This is 87.7 percent of the Permitted Waste Acceptance Rate. For the traffic analysis, the ratio of the maximum permitted amount to actual accepted amount of material (597,000 to 524,874) was used to forecast the maximum daily truck volume to 286 trucks. This includes trucks delivering waste, covers soils, and BUD materials. As the Proposed Action will not modify the Permitted Waste Acceptance Rate, this maximum daily volume will be valid for the life of the permit.

The day of the intersection counts, Wednesday, September 25, 2013, 162 trucks delivered 2,576 tons of material. The *maximum* daily to *actual* daily ratio (286 to 162) is used to extrapolate the maximum peak hour truck volumes.

2. Temporary Construction Traffic

Construction traffic will consist primarily of dump trucks hauling stone and clay material for new cell construction, liner construction, and cover materials. Construction activities associated with the Proposed Landfill Expansion are expected to occur every two (2) or three (3) years over the life of the permit as existing cells reach capacity and new cells are constructed. The forecasted construction traffic will be the same as existing traffic that already occurs under the current permit.

Construction traffic data was collected by Mill Seat Landfill for the week of the intersection counts. The highest daily truck count was 58 trucks occurring on Tuesday, September 24, 2013 and again on Friday, September 27, 2013. Interviews with Mill Seat Landfill personnel indicate these daily highs are typical for current construction traffic, but as construction operations vary, a maximum of 75 trucks per day can be expected. This estimate includes 16 additional trucks per day which will haul cover material from off site.

The day of the intersection counts, Wednesday, September 25, 2013, 38 construction trucks delivered clay and stone to the Permitted Site. The *maximum* daily to *actual* daily ratio (75 to 38) is used to extrapolate the maximum peak hour construction volumes.

Table I illustrates the peak hour trip generation estimates derived from the existing peak hour truck volumes.

	TABLE I							
DESCRIPTION	AM P	EAK	PM PEAK					
DESCRIPTION	ENTER	EXIT	ENTER	EXIT				
Existing Landfill Truck Traffic (162 trucks per day)	13	13	2	2				
Existing Construction Traffic (38 trucks per day)	6	2	1	1				
Additional Landfill Truck Traffic including cover soils (based on an additional 124 trucks/day)	10	10	2	2				
Additional Construction Traffic (based on an additional 37 trips/day)	6	2	1	1				
Total	35	27	6	6				

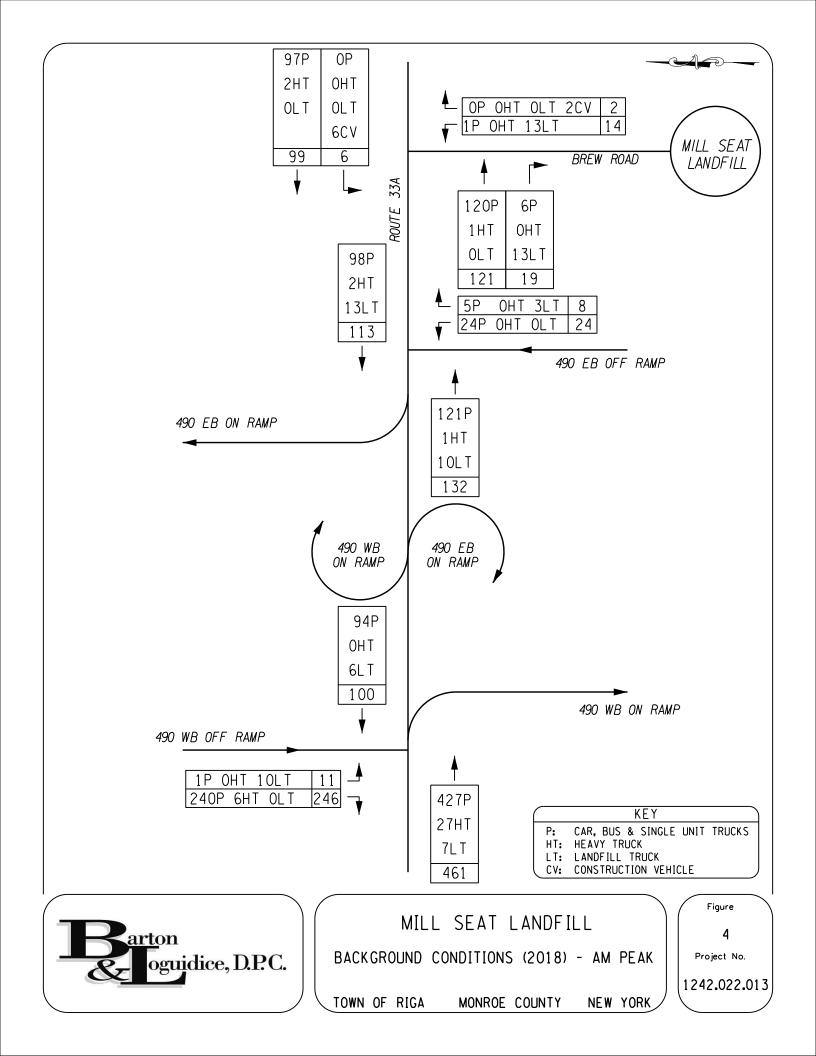
C. Site Traffic Distribution

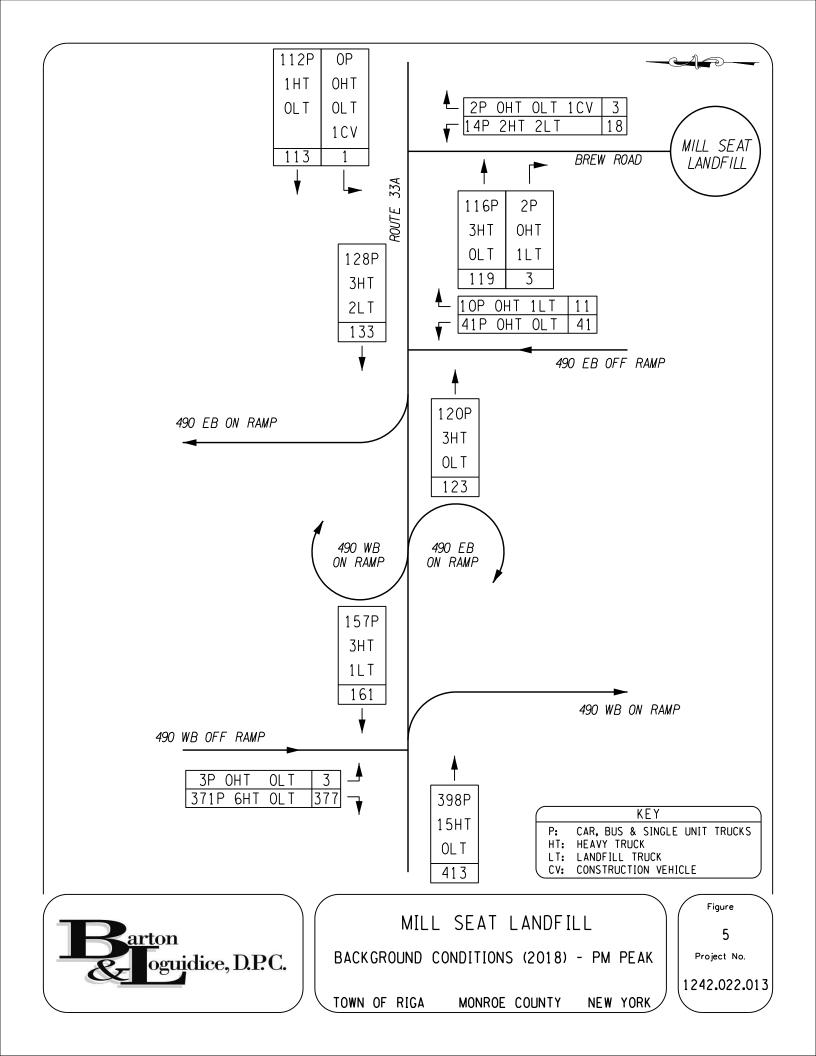
It is anticipated that newly generated landfill traffic volumes will follow existing travel patterns of vehicles accessing the Mill Seat Landfill; these patterns were found to be consistent with the pattern proposed in the original Traffic Impact Analysis for the Permitted Site.

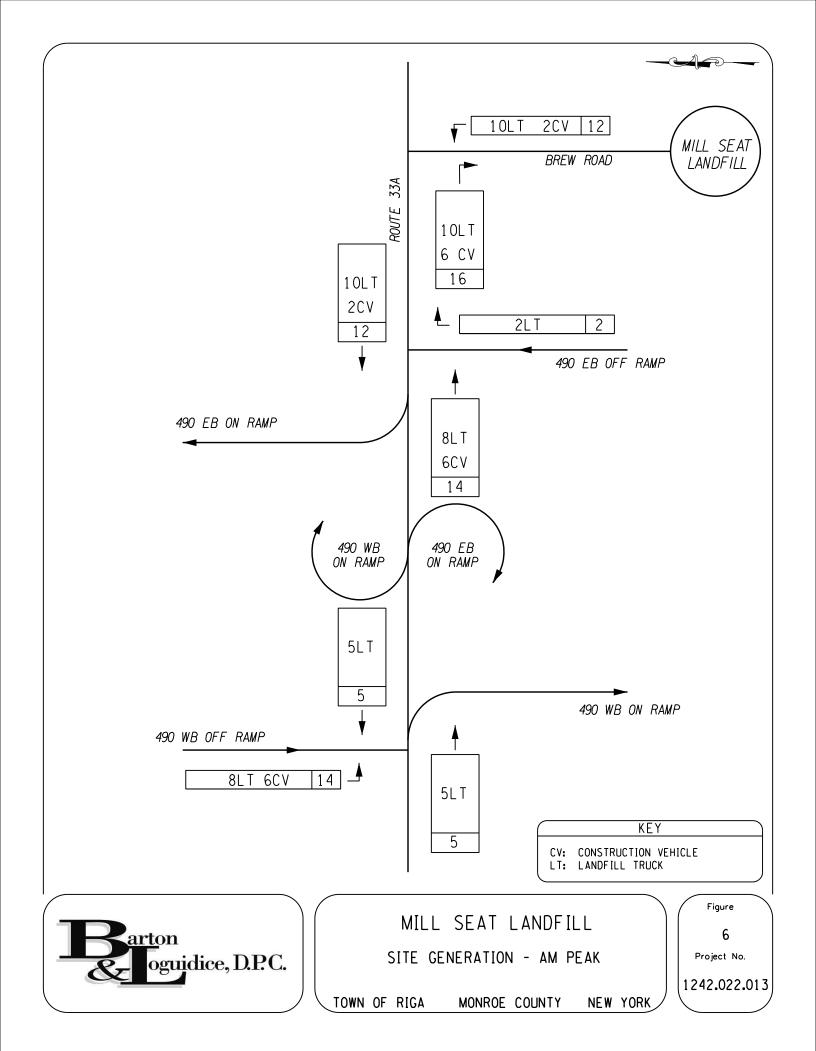
Construction traffic destined for the Proposed Site will be travelling from the east and will utilize I-490 and Route 33A eastbound to Brew Road. Construction vehicles leaving the Proposed Site would take the reverse route (Brew Road to Route 33A westbound to I-490). Figures 6 and 7 show the combined site generated traffic as assigned to the study area intersections.

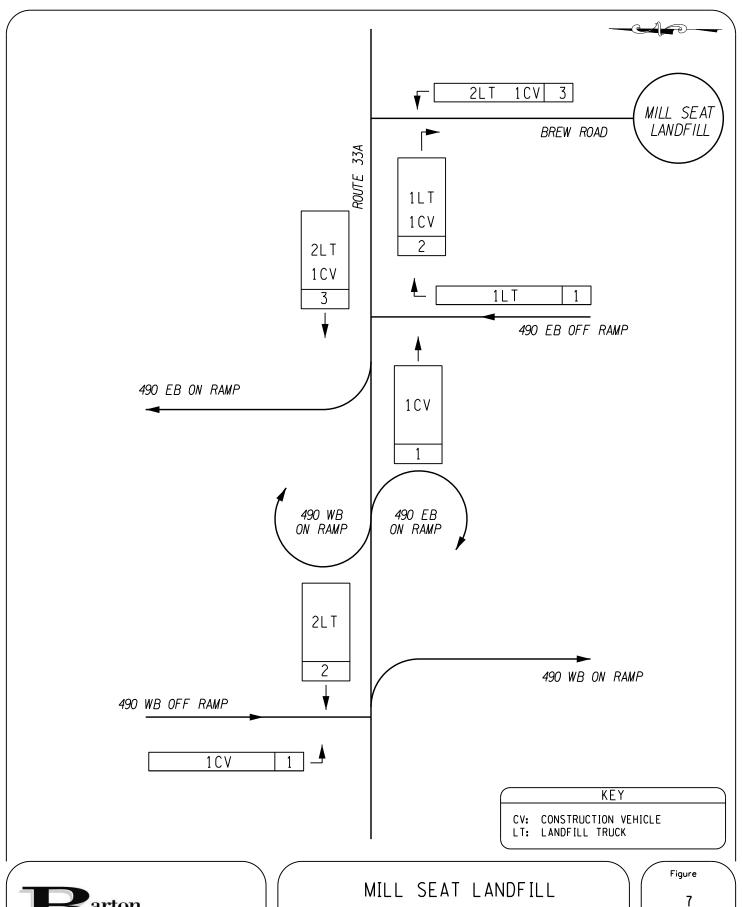
VI. PROJECTED DESIGN HOUR VOLUMES

The projected design hour traffic volumes were developed for each peak by combining the background traffic conditions (Figures 4 and 5) and newly created traffic generations (Figures 6 and 7) to yield the total traffic conditions expected as a result of the maximum truck traffic accessing the Proposed Site. Figures 8 and 9 show the total weekday peak hour volumes for the projected traffic forecasted to the end of the permit.







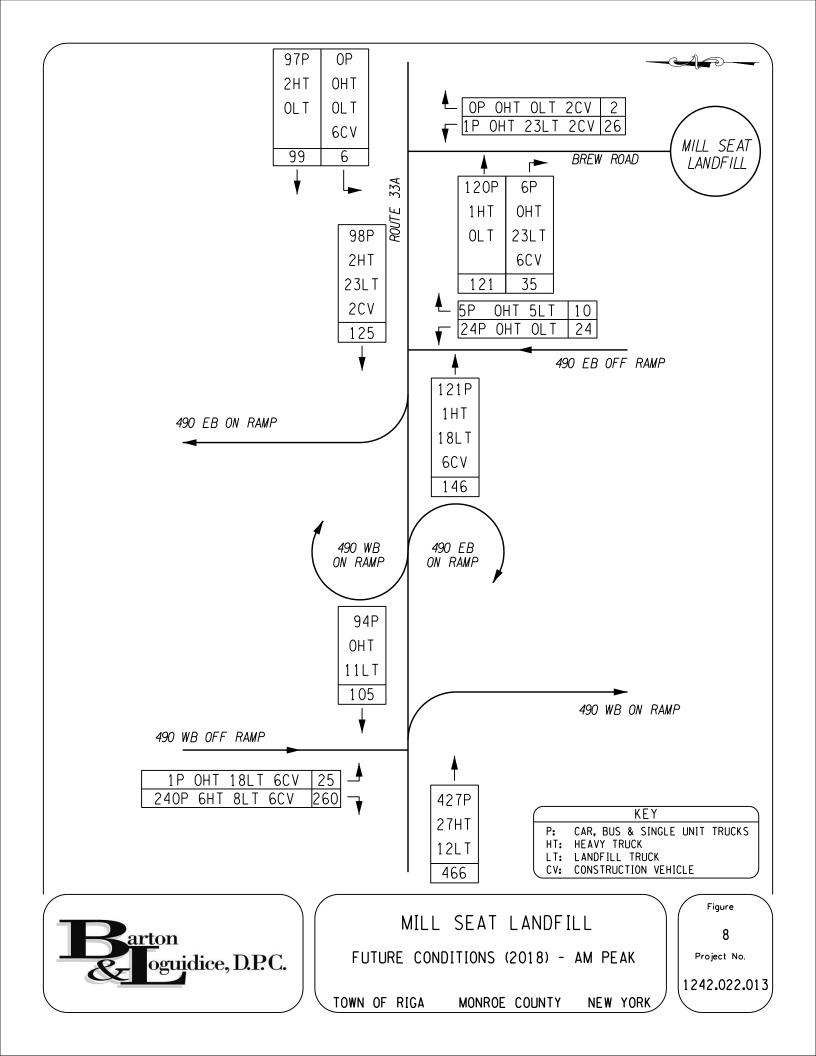


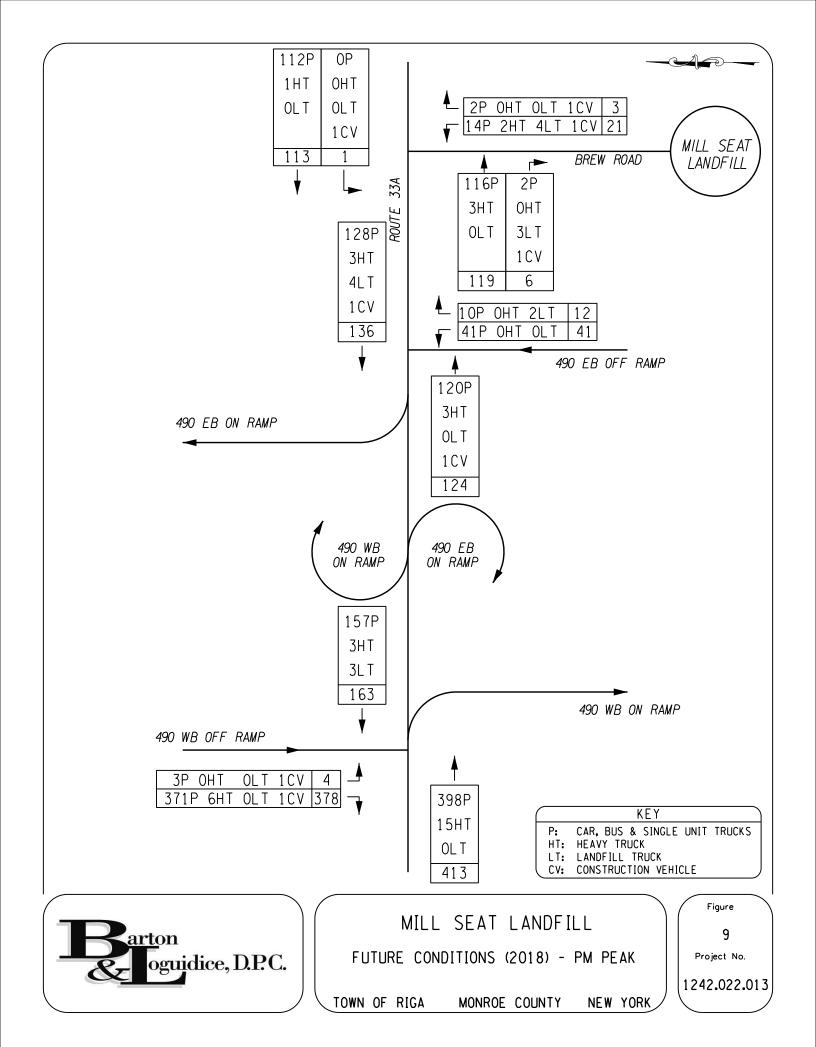


SITE GENERATION - PM PEAK

TOWN OF RIGA MONROE COUNTY **NEW YORK** Project No.

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VII. CAPACITY ANALYSIS

The capacity of the highway system is predicated on two (2) components: the capacity of the included roadway sections and the capacity of the affected intersections along the route. The roadway sections involved can accommodate the proposed increase in traffic projected with very little impact to through traffic based on the analysis in this Report.

Intersecting roadways generally provide the initial constraint on a system's capacity. Efficiency at the intersections becomes the critical constraint for capacity. Vehicle interactions at these points must therefore be analyzed to assess the projected capacity levels.

The standard procedure for capacity analysis of signalized and unsignalized intersections is outlined in the 2010 Highway Capacity Manual published by the Transportation Research Board. Version 6.3 of the 2010 Highway Capacity Software was used to analyze operating conditions at study area intersections. The procedure yields a LOS as an indicator of how well intersections operate. LOS is defined in terms of delay which is a measure of driver discomfort, frustration, fuel consumptions, and lost travel time.

The concept of LOS is defined as a qualitative measure describing operating conditions within a traffic stream, and their perception by motorists and/or passengers. Six (6) LOS are defined for analysis purposes. They are assigned letter designations, from "A" to "F", with LOS "A" representing the best conditions and LOS "F" the worst. Suggested ranges of service capacity and an explanation of LOS are included in Appendix H.

The projected traffic conditions generated by the Proposed Action were analyzed to assess the operations of the study intersections. Capacity results including LOS and average delay in seconds of the existing, background, and projected conditions are listed in Table II. All capacity analysis calculations are included in Appendices E, F, and G. The discussion following Table II summarizes the existing, background, and projected capacity conditions. The PM peak hour results for the projected conditions include the superimposed site generated traffic as discussed earlier.

		TABL	E II							
DESCRIPTION	EXIS CONDI		BACKGI CONDI		PROJECTED CONDITIONS					
	AM Peak LOS (sec)	PM Peak LOS (sec)	AM Peak LOS (sec)	PM Peak LOS (sec)	AM Peak LOS (sec)	PM Peak LOS (sec)				
Route 33A/WB Off Ramp Southbound	B (10.2)	B (11.6)	B (10.5)	B (12.1)	B (10.9)	B (12.2)				
Route 33A/ EB Off Ramp Northbound	A (9.6)	A (9.9)	A (9.8)	B (10.1)	A (9.9)	B (10.2)				
Route 33A/ Brew Road Northbound Westbound Left	B (12.0) A (8.8)	B (10.5) A (7.4)	B (12.3) A (8.9)	B (10.9) A (8.8)	B (12.9) A (9.0)	B (11.2) A (8.8)				

All resulting capacity levels represent acceptable LOS ("B" or better). The results of the capacity analyses indicate that the background traffic growth (1.5% per year) coupled with any additional landfill traffic will have little or no effect on the peak operation of the 490 off-ramps and on Route 33A. The LOS theoretically changes from "A" to "B" for the eastbound 490 off-ramp under the Proposed Action conditions. Two (2) points are noted about this theoretical increase:

- 1. The existing delay (9.6 seconds AM, 9.9 seconds PM) for this movement is already at the upper range of LOS "A". The delay threshold between LOS "A" and "B" is 10.0 seconds. The actual increase in average delay is three-tenths (0.3) seconds for the AM Peak and three-tenths (0.3) seconds for the PM Peak.
- 2. The increase in delay is due mostly to background traffic growth forecasted to the end of the permit; accounting for two-tenths (0.2) seconds for the AM Peak and two-tenths (0.2) seconds for the PM Peak.

The above projected results are based on the Permitted Waste Acceptance Rate, which is represented by the worst case scenario of 266 trucks per day. It is important to note that the average daily condition is 200 trucks or less.

VIII. TRAFFIC PATTERN IMPACTS

Traffic patterns, unrelated to the Proposed Action traffic, may be impacted in the area surrounding the Proposed Site. The western end of O'Brien Road intersects Brew Road within the limits of the Proposed Action. A portion of Brew Road intersects the permitted eastern borrow area, where soil borrow activities have already begun. There is currently one (1) driveway access off of this southern portion of Brew Road and seven (7) driveway accesses on O'Brien Road. The abandonment of approximately seven-tenths (0.7) miles of Brew Road from O'Brien Road to Bovee Road will include providing a new driveway access off of Bovee Road for the Brew Road residence. Approximately four-tenths (0.4) miles of O'Brien Road will be abandoned.

The remaining portion of O'Brien Road will remain open and a turn-around will be installed by the Town of Riga as a separate action to maintain the existing driveways and traffic on O'Brien Road. The abandonment of the southern portion of Brew Road, and the demapping of the aforementioned roadway and Brew Road will be terminated in an approved manner. Brew Road and O'Brien Road are both low volume rural roadways and the proposed traffic changes will have negligible impact to the surrounding roadway network.

IX. SAFETY INVESTIGATION

Review of accident data for the most recent ten(10) years available (February 28, 2003 through February 28, 2013) indicated two (2) accidents occurred on Route 33A at Brew Road: one (1) involving a collision with a deer and another a collision with a utility pole. Neither accidents involved injury and neither resulted in more than \$1,000 in damage. The collision with utility pole occurred during freezing conditions and was attributed to unsafe speed. These are considered "non-reportable" type accidents in NYSDOT's Accident Location Information System.

X. CONCLUSIONS

This report has addressed the combined traffic impact that can be expected on the surrounding roadway network as a result of the Proposed Action. It has been documented that the existing transportation network can accommodate the projected truck traffic volumes, and will not adversely impact traffic on the adjacent roadways. No noticeable changes in operating conditions are anticipated at any of the study area intersections as a result of the Proposed Action and no modifications to the study area intersections are warranted or recommended.

APPENDIX A

NYSDOT Traffic Counts

11.14 1242.022.013

New York State Department cof Transportation Traffic Volume Report

Date: 09/25/2012 Page: 239 of 294

YR

LATEST COUNT -----PREVIOUS COUNTS-----County End Mile Count LOC Section Section End **EST EST EST EST Count Station** Point Reference Marker Length Description **AADT** YR AADT YR AADT YR AADT YR Number Order NY481 **OSWEGO** Route County Region ** **FULTON CITY LN** 12.56 00.13 ** 19.75 481 34022024 07.19 OSWEGO S CITY LN 21.23 ** 01.48 SYRACUSE AVE 481 34023072 ** 21.96 481 34024015 00.73 **UTICA ST** 22.25 481 34024023 00.29 RT 104 END 481 **NY488** County **ONTARIO** Route Region 00.00 **RT 21 CHAPIN** 00.00 09.53 88 44012023 RT 96 END 488 09.53 Route County **GENESEE** Region 00.00 00.00 **RT 90I INTER 47** 00.19 00.19 ACC RT 19 VALLANCE RD 01.38 490141011002 01.19 MONROE CO LINE County MONROE Region Route 02.00 ** 02.00 RT 33A IS OVER WITH CONN EXIT 2 RT 36 IS OVER WITH CONN EXIT 3 04.97 02.97 ** ** 09.40 04.43 RT 259 UNION ST IS OVER WITH CONN EXIT 4 12.71 03.31 RT 386 IS UNDER WITH CONN EXIT 5 ** 14.40 01.69 RT 204 AIRPORT IS UNDER WITH CONN EXIT 6 15.20 00.80 RT 33 IS UNDER WITH CONN EXIT 7 ** 15.79 00.59 **RT 531 EXIT 8** ** 17.64 01.85 ACC 390I 390 OUTER LOOP EXIT 9 18.79 01.15 MT READ BLVD UNDER WITH CONN EXIT 10 ** 19.57 00.78 RAMPS AMES ST OVER WITH CONN EXIT 11 19.83 00.26 RAMPS CHILD ST OVER CONN EXIT 11 20.47 00.64 **BROWN ST UNDER WITH CONN EXIT 12** 20.87 00.40 ACC INNER LOOP 1ST TM 21.38 00.51 PLYMOUTH AVE ** 21.56 00.18 **INNER LOOP & RT 15** 22.54 00.98 GOODMAN ST OVER WITH CONN 0541 CC 22.99 00.45 RT 31 MONROE AVE OVER WITH CONN 23.53 00.54 CULVER RD OVER WITH CONN 24.53 01.00 ACC WINTON RD 24.82 00.29 RT 590I 107530 97 25.06 00.24 RT 590 25.65 00.59 PENFIELD RD ** 26.44 00.79 RT 441 LINDEN RD 27.76 01.32 E ROCHESTER CONN 28.17 00.41 **RT 31F** 30.75 02.58 **RT 31**

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County Order Point Reference Marker Length Description Length Description Description Reference Marker Length Description Length Description Reference Marker Length Description Description Reference Marker Length Description D	
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	006
2 16.42 33 41022026 00.63 BATAVIA E CITY LN 7630 ** 7650 08 10100 05 14430 02 0208	208
2 18.59 33 41022031 02.17 PROLE RD CR 19B 7390 ** 7400 09 5590 06 6360 03 0027	027
2 21.33 33 41023022 02.74 RT 237 5540 ** 5570 09 5730 05 5900 99 0425	425
2 28.16 33 41023050 06.83 RT 19 5870 ** 5910 09 5420 06 5870 03 0427	427
2 28.53 33 41023118 00.37 RT 33A 7050 ** 7090 09 10090 06 7450 04 0428	428
2 29.36 33 41023122 00.83 ROCHESTER ST 2050 ** 2070 09 1820 06 2150 05 0429	429
2 29.56 33 41023129 00.20 MONROE CO LINE 2250 11 2420 07 2810 04 4030 01 0017	017
Route NY33 County 055 MONROE Region 04	
3 02.63 33 41023130 02.63 START 36 OLAP CHURCHVILLE 3160 ** 3190 09 2440 05 4780 02 0174	174
3 03.46 33 43031027 00.83 END 36 OLAP 4550 ** 4600 07 4260 04 4570 00 0417	417
3 06.83 33 43031035 03.37 RT 259 N CHILI 7030 ** 7070 09 6560 04 8700 01 0430	430
3 08.67 33 43031069 01.84 STONY PT RD CR 169 8720 ** 8730 09 8060 04 9870 01 0182	182
3 10.77 33 43031087 02.10 START RT 386 OLAP 10580 ** 10600 09 10990 05 11440 97 0572	572
3 10.97 33 43031108 00.20 END RT 386 OLAP 16350 11 17320 07 17160 04 15780 01 0431	431
3 11.72 33 43031110 00.75 RT 490I IS OVER WITH CONN 14950 ** 14970 09 15910 05 19680 04 0573	573
3 13.13 33 43031118 01.41 HOWARD RD 13450 11 16290 08 13730 06 15210 03 0015	015
3 14.12 33 43031132 00.99 ROCHESTER W CITY LN 11660 ** 11680 08 10790 07 11180 04 0432	432
3 14.74 33 43031141 00.62 MOUNT READ BLVD 10300 ** 10300 10 12770 07 13240 04 0433	433
3 15.97 33 43032007 01.23 RT 33A 12340 ** 12350 10 15740 07 10480 04 0434	434
3 16.89 33 43032020 00.92 RT 31 END RT 33 18180 ** 18250 05 19890 02 17100 98 0435	435
Route NY33A County 037 GENESEE Region 04	
1 00.00 00.00 RT 33	
1 00.28 33A41011000 00.28 MONROE CO LN ACC 490I 8610 ** 8640 10 9130 07 8700 04 0522	522
Route NY33A County 055 MONROE Region 04	
2 02.65 33A41011003 02.65 START 36 OLAP RIGA 2390 11 2950 07 2640 04 2610 01 0523	523
2 02.88 33A43021027 00.23 END 36 OLAP RIGA 3100 ** 3120 09 4470 05 5500 02 0415	415
2 07.63 33A43021030 04.75 RT 259 W CHILI 2600 ** 2620 09 3490 06 3820 05 0524	

	END E MILE ER POINT	COUNT LOC REFERENCE MARKER	SECTION LENGTH	SECTION ENDS AT	LATEST CO EST AADT Y	EST	EST	DUNTS EST R AADT YR	COUNT STATIC NUMBER
				REGION 5 COUNTY 3 ERIE					
33	0110764	33 53012021		ACC RT 277 UNION RD ACC CAYUGA DICK RDS ACC GENESEE ST JCT 952A AC	65000 **	63000 02	65800 97	63400 91	0085
33	0110818	33 53012023		ACC CAYUGA DICK RDS	51900 04	55400 03	51300 02	50200 97	0166 CC
33	0110852	33 53012030		ACC GENESEE ST JCT 952A AC	33600 **	33100 02	30500 98	33600 95	0086
33	0110909	33 53012036		ACC AIRPORT E ENT	44500 **	43600 01	38700 98	44000 96	Q168
33	0110964	33 53012041	0.55	ACC CR 539 HOLTZ RD	41200 **	40600 02	41700 99	40700 98	0169
33	0111073	33 53012051	1.09	ACC RT 78 TRANSIT RD	31600 **	31200 02	31000 99	30800 96	0005
33	0111186	33 53012057		CR 57 HARRIS HILL RD	16500 **	16400 03	21900 01	18300 99	0167
33	0111415	33 53012076		CR 288 GUNVILLE RD	14800 **	14700 03	13800 02	13800 99	0383
33 33	0111619 0111952	33 53012100		CR 155 KANSUM RD	8800 **	8700 02	7500 97	7450 94	0141
	0112281	33 53012141 33 53012145		OCH RI 952Q WALDEN AVE	2550 04	3400 02	4100 98	3450 91	0142
33	0112201	33 53012145	3.29	ACC GENESEE SI UCI 952A AC ACC AIRPORT E ENT ACC CR 539 HOLTZ RD ACC RT 78 TRANSIT RD CR 57 HARRIS HILL RD CR 288 GUNVILLE RD CR 155 RANSOM RD JCT RT 952Q WALDEN AVE GENESEE CO LINE	8600 **	8450 02	8150 99	8300 98	0143
				REGION 4 COUNTY 1 GENES	EE				
33	0210307	33 41021015		RT 77 CORFU	5050 **	4850 02	6300 01	5850 99	0289
33	0211070	33 41021090		RT 77 CORFU WORTENDYKE RD CR 37 BATAVIA W CITY LN START 98 OLAP END 98 START 5 63 OLAPS END 63 OLAP	2800 04	5200 01	4050 96	3850 90	0025
33	0211330	33 41021133		BATAVIA W CITY LN	4850 **	4500 99	3650 94	5100 91	0421
33	0211424	33 41022002		START 98 OLAP	6950 **	6850 03	6950 00	6050 98	0422
33	0211432	33 41022010		END 98 START 5 63 OLAPS	12800 **	12600 03	12400 00	13000 98	0423
33	0211459	5 41032008	0.27	END 63 DLAP	39300 **	38200 02	33200 99	33900 96	0424
33	0211579	5 41032019	1.20	END 5 OLAP	16800 **	16500 03	19400 00	19400 97	0006
33	0211642	33 41023001	0.63	BATAVIA E CITY LN	14900 **	14400 02	11100 98	8250 95	0208
33	0211859	33 41023021	2.17	PROLE RD CR 19B	6500 **	6350 03	6150 00	7900 97	0027
33	0212133	33 41023027	2.74	RT 237	8350 **	8050 02	5900 99	5450 96	0425
33	0212816	33 41023094	6.83	RT 19	6000 **	5850 03	6350 00	6450 97	0427
33	0212853	33 41023119	0.37	RT 33A	7450 04	7300 01	7850 98	5950 94	0428
	0212936	33 41023124		ROCHESTER ST	2150 **	2050 02	1500 99	2550 96	0429
33	0212956	33 43031000	0.20	END 98 START 5 63 DLAPS END 63 OLAP END 5 OLAP BATAVIA E CITY LN PROLE RD CR 19B RT 237 RT 19 RT 33A ROCHESTER ST MONROE CO LINE	2800 04	3750 01	2950 98	2500 94	0017
				REGION 4 COUNTY 3 MONRO	E				
33	0310263	33 43021013		START 36 OLAP CHURCHVILLE	5000 **	4800 02	3550 99	2950 98	0174
33	0310346	33 43031034	0.83	END 36 OLAP	4250 04	4550 00	5900 98	4800 94	0417
33	0310683	33 43031055	3.37	START 36 OLAP CHURCHVILLE END 36 OLAP RT 259 N CHILI STONY PT RD CR 169 START RT 386 OLAP END RT 386 OLAP RT 4901 IS OVER WITH CONN	6550 04	11600 03	8150 01	7400 98	0430
33	0310867	33 43031073		STONY PT RD CR 169	8050 04	9850 01	8800 00	9650 97	0182
33	0311077	33 43031095	2.10	START RT 386 OLAP	12700 **	11400 97	12200 94	13900 92	0572
33	0311097	33 43031108	0.20	END RT 386 OLAP	17200 04	15400 01	16100 98	14800 95	0431
33	0311172	33 43031115	0.75	RT 490I IS OVER WITH CONN	19700 04	17400 01	18600 97	18000 94	0573
33	0311313	33 43031124		DUBAKU KU	154()() **	15200 03	15500 99	19300 98	0015
33	0311412	33 43031134	0.99	ROCHESTER W CITY LN	11200 04	14500 01	10800 97	9300 94	0432
33	0311474	33 43032003	0.62	MOUNT READ BLVD	13200 04	10000 01	11400 97	9900 94	0433
33			1.23	ROCHESTER W CITY LN Mount Read BLVD RT 33A	10500 04	9850 01	8900 98	7700 93	0434
33	0311689	33 43032025	0.92	RT 31 END RT 33	20500 **	19900 02	17100 98	16800 95	0435
				REGION 4 COUNTY 1 GENES	EE				
334	0110028	33A41011000		MONROE CO LN ACC 490I	9700.04	8300 01	5650 98	8500 95	0522
JJA	0110020	33M4 IU I IUUU	V. 48	MUNKUE CU LM ACC 4901	0/00 04	0300 01	2020 38	9900 99	U322

	END	COUNT LOC			LATEST	COUNT		PRI	EVIOUS	COUN	สร		COUNT
	MILE		SECTION		EST		EST		EST		EST		STATION
NUMBER	POINT	MARKER	LENGTH	SECTION ENDS AT	AADT	YR	AADT	YR	AADT	YR	AADT	YR	NUMBER

				DECION 4 COUNTY O MONDO	0.5							
33A	0210265	33A43021015	2.65	START 36 OLAP RIGA	2650 04	2450	01	2450	98	2450	95	0523
يوويا	00 10000	-00440024027	0.00	5ND 80 8LAP RESA	5050 ++	5450	-00-		-00			3445
33A	0210763	33A43021047	4.75	RT 259 W CHILI	3100 **	3000	02	3100	99	3450	96	0524
	0210929	33A43021088	1.66	RT 252	11500 **	11300	03	15000	01	10100	98	0571
33A	0210960	33A43021096	0.31	START 386 OLAP	7450 **	7200	02	7800	99	5950	96	0062
	0211061	33A43021103	1.01	RT 252A END 386 OLAP	14200 **	13800	02	13200	99	11100	96	0359
	0211318	33A43021120	2.57	START 204 DLAP	12000 04	11800	01	11500	98	9800	95	0574
	0211388	33A43021135	0.70	HOWARD RD	20300 04	18200	01	19000	96	17700	95	0525
	0211403	33A43021140	0.15	END 204 OLAP	25800 04	29600	01	23300	97	21200	94	0013
33A	0211513	33A43021149	1.10	RT 259 W CHILI RT 252 START 386 OLAP RT 252A END 386 OLAP START 204 OLAP HOWARD RD END 204 OLAP RT 390I OUTER LOOP ROCHESTER W CITY LN	14200 04	11400	01	13100	98	15000	93	0789
33A	0211530	33A43021153	0.17	ROCHESTER W CITY LN	16800 04	14100	01	13100	98	12600	95	0790
33A	0211687	33A43022029	1.57	RT 33 END 33A	13700 **	13100	01	10300	93	9350	90	0063
				REGION 6 COUNTY 5 TIOG	A							
34			0.00	RT 17 WAVERLY								
34	0110072	34 65011203	0.72	RT 17 C N CHEMUNG ST VILLAGE OF WAVERLY	7000 04			6950		6800		0018
34	0110082	17 65011022	0.10	N CHEMUNG ST	7700 **			6950		6850		0092
34	0110109	34 65011001	0.27	VILLAGE OF WAVERLY	6350 **			5800		5450		0093
34	0110681	34 62011028	5.72	MAIN ST LOCKWOOD	3950 **	-		3350		3350		0094
34	0111133	34 65011082	4.52	CHEMUNG CO LINE	2150 **	1950	98	1800	95	1550	92	0095
				REGION 6 COUNTY 2 CHEM								
34	0210332	34 62021020	3.32	RT 224 VAN ETTEN	2050 **	1850		2100		1800		0295
34	0210414	34 62021037	0.82	TIOGA CO LN 2ND TIME	4650 **	4500	02	4500	99	4250	96	0012
				REGION 6 COUNTY 5 TIOG	A							
34	0310224	34 65031009	2.24	START 96 OLAP SPENCER	5600 **	5150	99	4600	93	4000	90	0200
34	0310575	34 65031038	3.51	CR 1 MICHIGAN HOLLOW RD	4100 **	4000	03	3450	00	3600	97	0004
34	0310750	34 65031068	1.75	TOMPKINS CO LINE	3300 **	3200	03	2700	00	2850	97	0005
				REGION 3 COUNTY 6 TOMP!	KINS							
34	0410660	34 36041050	6.60	CR 130 NEWFIELD STA	4050 **	4000	03	3900	00	3650	97	0483
34	0410869	34 36041084	2.09	START 13 OLAP	6250 **	6100	02	5700	99	5250	96	0482
34	0410919	13 36031110	0.50	CR 130 NEWFIELD STA START 13 OLAP RT 327 RT 13A ITHACA S CITY LN RT 98B RT 79 EB GREEN ST PT 79 WB SENECA ST	18600 **	17900	01	15200	98	16000	97	0480
34	0411033	13 36031118	1.14	RT 13A	15600 04	18600	01	16600	98	17800	97	0477
34	0411082	13 35031126	0.49	ITHACA S CITY LN	17000 **	16300	01	16600	98	18100	97	0475
34	0411237	13 36032013	1.55	RT 96B	26500 **	25400	01	22600	98	19900	90	0004
34	0411248	13 36032016	0.11	RT 79 EB GREEN ST	29800 04	29200	01	26700	98	20600	93	0003
34	0411260	13 36032017	0.12	KI 13 MD SEIVEGA SI	01100 04			29600	98	25600		0016
34	0411267	13 38032018	0.07	END RT 96 OLAP BUFFALO ST	38400 04			32800		22600		0023
34	0411418	13 36032031	1.51	ITHACA N CITY LN	36200 **			32900		32800		0576
34	0411428	13 36033001	0.10	END 13 OLAP	32200 04			32500		25100	99	0029 CC
34	0411995	34 36043006	5.67		8600 **	8450		8100		7700		0457
34	0412043	34 36043059	0.48	END 34B OLAP	8550 **	7950		6900		8250		0571
34	0412674	34 36043122	6.31	CAYUGA CO LINE	2650 **	2600	03	2200	00	2100	98	0570

APPENDIX B

Turning Movement Counts

11.14 1242.022.013

Barton & Loguidice, P.C. 11 Centre Park

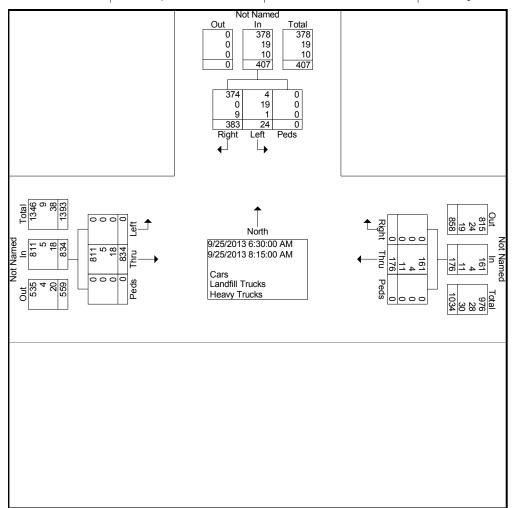
I-490 WB Off-Ramp AM Count 11 Centre Park Suite 203 Rochester, NY 14614

File Name : 003W6-~E Site Code : 00000001 Start Date : 9/25/2013

Page No : 1

Groups	Printed- Cars	- Landfill Trucks	- Heavy Trucks
Oloups	i illitou- Oais	- Landin Hucks	- I ICAVY I I UCINO

		Fr	om No	orth			F	rom E	ast			Fr	om So	outh			Fr	om W	est		
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.
Time	ht	u		s	Total	ht	u	LCIL	S	Total	ht	u	LCIT	s	Total	ht	u	LCIT	s	Total	Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
06:30 AM	22	0	2	0	24	0	12	0	0	12	0	0	0	0	0	0	121	0	0	121	157
06:45 AM	35	0	5	0	40	0	23	0	0	23	0	0	0	0	0	0	116	0	0	116	179
Total	57	0	7	0	64	0	35	0	0	35	0	0	0	0	0	0	237	0	0	237	336
										,										'	
07:00 AM	47	0	2	0	49	0	16	0	0	16	0	0	0	0	0	0	101	0	0	101	166
07:15 AM	58	0	1	0	59	0	30	0	0	30	0	0	0	0	0	0	120	0	0	120	209
07:30 AM	66	0	3	0	69	0	21	0	0	21	0	0	0	0	0	0	117	0	0	117	207
07:45 AM	58	0	4	0	62	0	26	0	0	26	0	0	0	0	0	0	90	0	0	90	178
Total	229	0	10	0	239	0	93	0	0	93	0	0	0	0	0	0	428	0	0	428	760
										'										'	
08:00 AM	54	0	2	0	56	0	21	0	0	21	0	0	0	0	0	0	86	0	0	86	163
08:15 AM	43	0	5	0	48	0	27	0	0	27	0	0	0	0	0	0	83	0	0	83	158
Grand	000	_		_	40=		4=0	•	_	4=0	•	_	_	•		_		_	_	004	
Total	383	0	24	0	407	0	176	0	0	176	0	0	0	0	0	0	834	0	0	834	1417
	94.						100										100				
Apprch %	1	0.0	5.9	0.0		0.0	.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	.0	0.0	0.0		
T 1 10/	27.	0.0	4 -	0.0	00.7		12.		0.0	40.4	0.0	0.0		0.0	0.0		58.	0.0	0.0	50.0	
Total %	0	0.0	1.7	0.0	28.7	0.0	4	0.0	0.0	12.4	0.0	0.0	0.0	0.0	0.0	0.0	9	0.0	0.0	58.9	
										,											



Barton & Loguidice, P.C. 11 Centre Park

I-490 WB Off-Ramp AM Count 11 Centre Park Suite 203 Rochester, NY 14614

File Name : 003W6-~E Site Code : 00000001 Start Date : 9/25/2013

Page No : 2

		Fr	om No	orth		From East						From South					From West					
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.	
Time	ht	u	LCIT	S	Total	ht	u	LCIT	s	Total	ht	u	LCIT	S	Total	ht	u	LCIT	s	Total	Total	
Peak Hour I	From 0	6:30 A	AM to (08:15	4M - Pe	eak 1 c	of 1															
Intersecti on	06:45	5 AM																				
Volume	206	0	11	0	217	0	90	0	0	90	0	0	0	0	0	0	454	0	0	454	761	
Percent	94. 9	0.0	5.1	0.0		0.0	100 .0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	100 .0	0.0	0.0			
07:15 Volume	58	0	1	0	59	0	30	0	0	30	0	0	0	0	0	0	120	0	0	120	209	
Peak																					0.910	
Factor																						
High Int.	07:30) AM				07:15	AM				6:15:0	MA 00	l			07:15	5 AM					
Volume	66	0	3	0	69	0	30	0	0	30	0	0	0	0	0	0	120	0	0	120		
Peak					0.78					0.75										0.94		
Factor					6					0										6		

Barton & Loguidice, P.C.

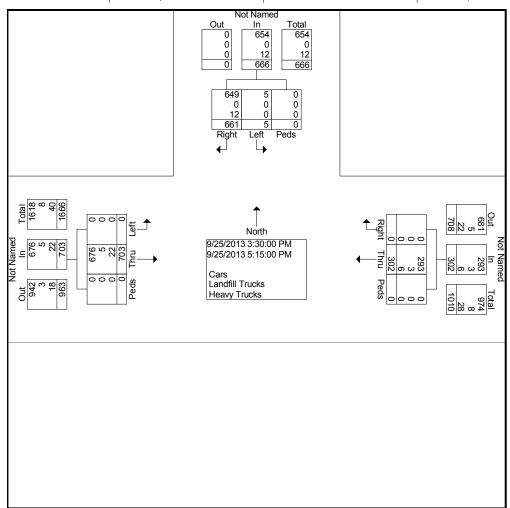
I-490 WB Off-Ramp PM Count 11 Centre Park Suite 203 Rochester, NY 14614

File Name : 003'#H~E Site Code : 00000001 Start Date : 9/25/2013

Page No : 1

Groups Printed- Cars - Landfill Trucks - Heavy Trucks

								_													
		⊢r	om No	ortn				rom E	ast				om So				FI	om W	est		
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.
Time	ht	u	5	s	Total	ht	u	LOIL	S	Total	ht	u	5	s	Total	ht	u	5	S	Total	Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
03:30 PM	69	0	1	0	70	0	38	0	0	38	0	0	0	0	0	0	80	0	0	80	188
03:45 PM	102	0	2	0	104	0	28	0	0	28	0	0	0	0	0	0	87	0	0	87	219
Total	171	0	3	0	174	0	66	0	0	66	0	0	0	0	0	0	167	0	0	167	407
															,						
04:00 PM	77	0	0	0	77	0	47	0	0	47	0	0	0	0	0	0	100	0	0	100	224
04:15 PM	91	0	1	0	92	0	39	0	0	39	0	0	0	0	0	0	83	0	0	83	214
04:30 PM	80	0	0	0	80	0	36	0	0	36	0	0	0	0	0	0	113	0	0	113	229
04:45 PM	76	0	0	0	76	0	36	0	0	36	0	0	0	0	0	0	64	0	0	64	176
Total	324	0	1	0	325	0	158	0	0	158	0	0	0	0	0	0	360	0	0	360	843
										'					'						
05:00 PM	89	0	1	0	90	0	45	0	0	45	0	0	0	0	0	0	84	0	0	84	219
05:15 PM	77	0	0	0	77	0	33	0	0	33	0	0	0	0	0	0	92	0	0	92	202
Grand		_	_	_				_	_		_	_	_	_	_	_		_	_		
Total	661	0	5	0	666	0	302	0	0	302	0	0	0	0	0	0	703	0	0	703	1671
	99.						100										100				
Apprch %	2	0.0	8.0	0.0		0.0	.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	.0	0.0	0.0		
-	39.						18.			40.4							42.			40.4	
Total %	6	0.0	0.3	0.0	39.9	0.0	1	0.0	0.0	18.1	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	42.1	



Barton & Loguidice, P.C. 11 Centre Park

I-490 WB Off-Ramp PM Count 11 Centre Park Suite 203 Rochester, NY 14614

File Name : 003'#H~E Site Code : 00000001 Start Date : 9/25/2013

Page No : 2

		Fr	om No	orth		From East						outh									
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.
Time	ht	u	LOIL	S	Total	ht	u	LOIL	S	Total	ht	u	LOIL	S	Total	ht	u	Lon	S	Total	Total
Peak Hour From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Intersecti on	03:45	РМ																			
Volume	350	0	3	0	353	0	150	0	0	150	0	0	0	0	0	0	383	0	0	383	886
Percent	99. 2	0.0	8.0	0.0		0.0	100 .0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	100 .0	0.0	0.0		
04:30 Volume	80	0	0	0	80	0	36	0	0	36	0	0	0	0	0	0	113	0	0	113	229
Peak																					0.967
Factor																					
High Int.							04:00 PM					00 PM				04:30					
Volume	102	0	2	0	104	0	47	0	0	47	0	0	0	0	0	0	113	0	0	113	
Peak					0.84					0.79										0.84	
Factor					9					8										7	

Barton & Loguidice, P.C.

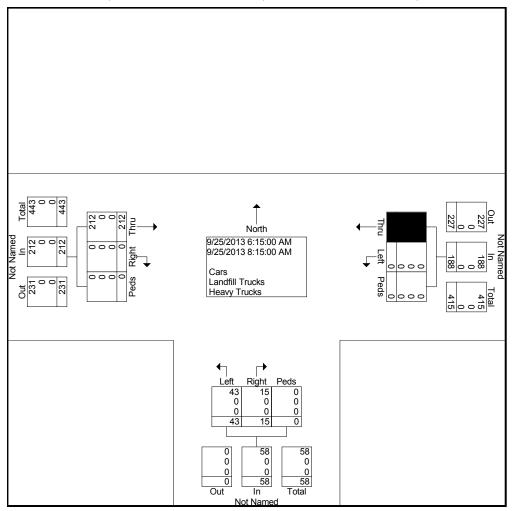
I-490 EB Off-Ramp AM Count 11 Centre Park Suite 203 Rochester, NY 14614

File Name : 003W6&~E Site Code : 00000002 Start Date : 9/25/2013

Page No : 1

Groups Printed- Cars - Landfill Trucks - Heavy Trucks

	From North						From Foot						om C	suth.									
011	D: 1		OHIN			From East						From South						From West					
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.		
Time	ht	u		S	Total	ht	u		S	Total	ht	u		S	Total	ht	u		S	Total	Total		
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0				
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
06:30 AM	0	0	0	0	0	0	15	0	0	15	2	0	2	0	4	0	29	0	0	29	48		
06:45 AM	0	0	0	0	0	0	19	0	0	19	3	0	5	0	8	0	28	0	0	28	55		
Total	0	0	0	0	0	0	34	0	0	34	5	0	7	0	12	0	57	0	0	57	103		
	·	·	·	·			٠.	·	·	•		·	•	•			٠.	•	·	0.			
07:00 AM	0	0	0	0	0	0	17	0	0	17	2	0	4	0	6	0	30	0	0	30	53		
07:15 AM	0	0	0	0	0	0	29	0	0	29	2	0	7	0	9	0	34	0	0	34	72		
07:30 AM	0	0	0	0	0	0	27	0	0	27	2	0	8	0	10	0	28	0	0	28	65		
07:45 AM	0	0	0	Ō	0	Ō	29	0	0	29	2	0	3	Ö	5	0	30	0	Ö	30	64		
Total	0	0	0	0	0	0	102	0	0	102	8	0	22	0	30	0	122	0	0	122	254		
Total	U	U	U	U	0		102	U	U	102	U	U	~~	U	50	U	122	U	U	122	204		
08:00 AM	0	0	0	0	0	0	25	0	0	25	2	0	5	0	7	0	14	0	0	14	46		
08:15 AM	Ô	Ô	Ô	Ô	Ö	Ö	27	Ö	Ô	27	0	Õ	9	Ô	9	0	19	Ö	Ô	19	55		
Grand	Ū	Ū	·	·	Ū	•		Ŭ	Ŭ			-	-	·	-			-	·				
Total	0	0	0	0	0	0	188	0	0	188	15	0	43	0	58	0	212	0	0	212	458		
Total							100				25.		74.				100						
Apprch %	0.0	0.0	0.0	0.0		0.0	.0	0.0	0.0		25. 9	0.0	74. 1	0.0		0.0	.0	0.0	0.0				
							41.										46.						
Total %	0.0	0.0	0.0	0.0	0.0	0.0	71.	0.0	0.0	41.0	3.3	0.0	9.4	0.0	12.7	0.0	4 0.	0.0	0.0	46.3			
							U										3						



Barton & Loguidice, P.C. 11 Centre Park

I-490 EB Off-Ramp AM Count Suite 203
Rochester, NY 14614

File Name : 003W6&~E Site Code : 00000002 Start Date : 9/25/2013

Page No : 2

		Fr	om No	orth		From East						om Sc	outh								
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.
Time	ht	u	Leit	s	Total	ht	u	Leit	s	Total	ht	u	Leit	s	Total	ht	u	LCIL	s	Total	Total
Peak Hour From 06:15 AM to 08:15 AM - Peak 1 of 1																					
Intersecti on	07:00) AM																			
Volume	0	0	0	0	0	0	102	0	0	102	8	0	22	0	30	0	122	0	0	122	254
Percent	0.0	0.0	0.0	0.0		0.0	100 .0	0.0	0.0		26. 7	0.0	73. 3	0.0		0.0	100 .0	0.0	0.0		
07:15 Volume	0	0	0	0	0	0	29	0	0	29	2	0	7	0	9	0	34	0	0	34	72
Peak																					0.882
Factor																					
High Int.	6:00:	00 AM				07:15					07:30	AM (07:15					
Volume	0	0	0	0	0	0	29	0	0	29	2	0	8	0	10	0	34	0	0	34	
Peak										0.87					0.75					0.89	
Factor										9					0					7	

Barton & Loguidice, P.C.

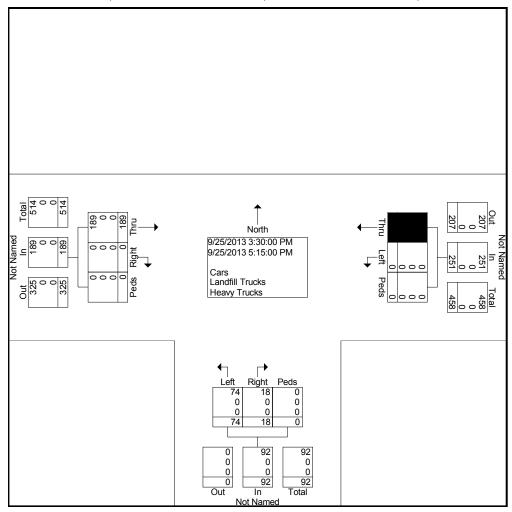
I-490 EB Off-Ramp PM Count 11 Centre Park Suite 203 Rochester, NY 14614

File Name : EBOFF-~1 Site Code : 00000002 Start Date : 9/25/2013

Page No : 1

Groups Printed- Cars - Landfill Trucks - Heavy Trucks

		Fr	om No	orth		From East						From South						From West					
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.		
Time	ht	u	4.0	S	Total	ht	u	4.0	S	Total	ht	u	4.0	S .	Total	ht	u	4.0	S	Total	Total		
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0				
03:30 PM	0	0	0	0	0	0	36	0	0	36	0	0	8	0	8	0	25	0	0	25	69		
03:45 PM	0	0	0	0	0	0	26	0	0	26	3	0	7	0	10	0	26	0	0	26	62		
Total	0	0	0	0	0	0	62	0	0	62	3	0	15	0	18	0	51	0	0	51	131		
04:00 PM	0	0	0	0	0	0	42	0	0	42	2	0	7	0	9	0	28	0	0	28	79		
04:15 PM	0	0	0	0	0	0	25	0	0	25	2	0	17	0	19	0	20	0	0	20	64		
04:30 PM	0	0	0	0	0	0	31	0	0	31	3	0	7	0	10	0	28	0	0	28	69		
04:45 PM	0	Ō	Ō	Ō	0	Ō	29	Ö	0	29	2	Ö	8	0	10	0	15	Ō	Ö	15	54		
Total	0	0	0	0	0	0	127	0	0	127	9	0	39	0	48	0	91	0	0	91	266		
Total	U	U	U	U	o l		121	U	U	121	9	U	00	U	40	U	31	U	U	01	200		
05:00 PM	0	Λ	0	0	0	0	38	0	Λ	38	4	0	10	0	14	0	20	0	0	20	72		
05:00 FM	0	0	0	0	0	0	24	0	0	24	2	0	10	0	12	0	27	0	0	27	63		
	U	U	U	U	U	0	24	U	U	24	2	U	10	U	12	U	21	U	U	21	03		
Grand	0	0	0	0	0	0	251	0	0	251	18	0	74	0	92	0	189	0	0	189	532		
Total					-																		
Apprch %	0.0	0.0	0.0	0.0		0.0	100 .0	0.0	0.0		19. 6	0.0	80. 4	0.0		0.0	100 .0	0.0	0.0				
							.0 47.				O		-										
Total %	0.0	0.0	0.0	0.0	0.0	0.0	41.	0.0	0.0	47.2	3.4	0.0	13.	0.0	17.3	0.0	35.	0.0	0.0	35.5			
							2						9				5			ļ			



Barton & Loguidice, P.C. 11 Centre Park

I-490 EB Off-Ramp PM Count 11 Centre Park Suite 203 Rochester, NY 14614

File Name : EBOFF-~1 Site Code : 00000002 Start Date : 9/25/2013

Page No : 2

		Fr	om No	orth			F	rom E	ast			Fr	om Sc	outh			Fr	om W	est		
Start Time	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Int. Total
Peak Hour I	rom 0	3:30 F	PM to	05:15	PM - Pe	eak 1 d	of 1												,		
Intersecti on	03:30	PM																			
Volume	0	0	0	0	0	0	129	0	0	129	7	0	39	0	46	0	99	0	0	99	274
Percent	0.0	0.0	0.0	0.0		0.0	100 .0	0.0	0.0		15. 2	0.0	84. 8	0.0		0.0	100 .0	0.0	0.0		
04:00 Volume	0	0	0	0	0	0	42	0	0	42	2	0	7	0	9	0	28	0	0	28	79
Peak																					0.867
Factor High Int.	2.15.0	10 DM				04:00	DM				04:15	DM				04:00	DM				
Volume	3.13.0	0 PIVI	ı 0	0	0	04.00	42	0	0	42	2	O CIVI	17	0	19	04.00	28	0	0	28	
Peak	Ŭ	Ü	J	Ŭ	Ū		72	Ü	Ü	0.76	_	Ü	.,	Ŭ	0.60		20	J	Ū	0.88	
Factor										8					5					4	

Barton & Loguidice, P.C.

11 Centre Park Suite 203 Rochester, NY 14614

Brew Road

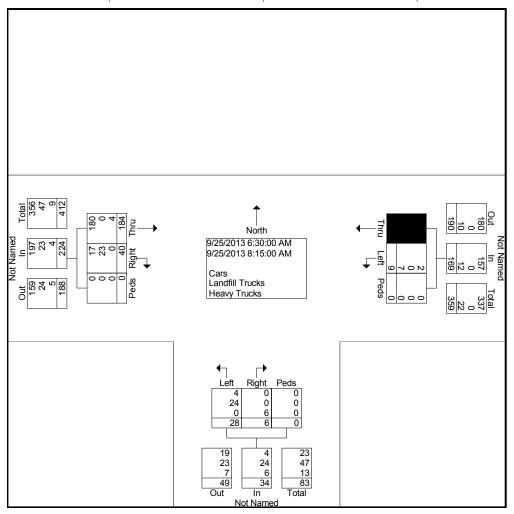
AM Count

File Name : 003W6%~E Site Code : 00000003 Start Date : 9/25/2013

Page No : 1

Groups Printed- Cars - Landfill Trucks - Heavy Trucks

									_											1		
L			⊢r	om No	ortn				rom E					om Sc	outh				om W	est		
	Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.
L	Time	ht	u		S	Total	ht	u		S	Total	ht	u	5	S	Total	ht	u	5	S	Total	Total
	Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
	06:30 AM	0	0	0	0	0	0	16	0	0	16	0	0	2	0	2	7	23	0	0	30	48
	06:45 AM	0	0	0	0	0	0	13	0	0	13	0	0	0	0	0	7	20	0	0	27	40
	Total	0	0	0	0	0	0	29	0	0	29	0	0	2	0	2	14	43	0	0	57	88
	07:00 AM	0	0	0	0	0	0	27	0	0	27	0	0	0	0	0	3	31	0	0	34	61
	07:15 AM	0	0	0	0	0	0	22	1	0	23	0	0	7	0	7	2	32	0	0	34	64
	07:30 AM	0	0	0	0	0	0	23	3	0	26	0	0	6	0	6	3	25	0	0	28	60
	07:45 AM	0	0	0	0	0	0	20	2	0	22	2	0	1	0	3	11	24	0	0	35	60
	Total	0	0	0	0	0	0	92	6	0	98	2	0	14	0	16	19	112	0	0	131	245
											'					'					'	
	08:00 AM	0	0	0	0	0	0	21	1	0	22	3	0	8	0	11	1	16	0	0	17	50
	08:15 AM	0	0	0	0	0	0	18	2	0	20	1	0	4	0	5	6	13	0	0	19	44
	Grand	_	_	_	_	_			_	_		_	_		_				_	_		
	Total	0	0	0	0	0	0	160	9	0	169	6	0	28	0	34	40	184	0	0	224	427
								94.				17.		82.			17.	82.				
	Apprch %	0.0	0.0	0.0	0.0		0.0	7	5.3	0.0		6	0.0	4	0.0		9	1	0.0	0.0		
								37.				·		•			_	43.				
	Total %	0.0	0.0	0.0	0.0	0.0	0.0	5	2.1	0.0	39.6	1.4	0.0	6.6	0.0	8.0	9.4	1	0.0	0.0	52.5	
								J													J	ı



Barton & Loguidice, P.C. 11 Centre Park

11 Centre Park Suite 203 Rochester, NY 14614

File Name : 003W6%~E Site Code : 00000003 Start Date : 9/25/2013

Page No : 2

		Fr	om No	orth			F	rom E	ast			Fr	om Sc	outh			Fr	om W	est		
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.
Time	ht	u	Leit	s	Total	ht	u	Leit	S	Total	ht	u	Leit	s	Total	ht	u	Leit	s	Total	Total
Peak Hour F	rom 0	6:30 A	AM to	08:15	AM - Pe	eak 1 c	of 1														
Intersecti on	07:00	AM																			
Volume	0	0	0	0	0	0	92	6	0	98	2	0	14	0	16	19	112	0	0	131	245
Percent	0.0	0.0	0.0	0.0		0.0	93. 9	6.1	0.0		12. 5	0.0	87. 5	0.0		14. 5	85. 5	0.0	0.0		
07:15	0	0	0	0	0	0	22	1	0	23	0	0	7	0	7	2	32	0	0	34	64
Volume	Ū	Ŭ	Ū	Ū	Ū			•	Ū			·	•	Ū		_	0_	Ŭ	Ŭ	٥.	
Peak																					0.957
Factor																					
High Int.	6:15:0	00 AM				07:00) AM				07:15	AM				07:45	5 AM				
Volume	0	0	0	0	0	0	27	0	0	27	0	0	7	0	7	11	24	0	0	35	
Peak										0.90					0.57					0.93	
Factor										7					1					6	

Barton & Loguidice, P.C.

11 Centre Park Suite 203

Brew Road

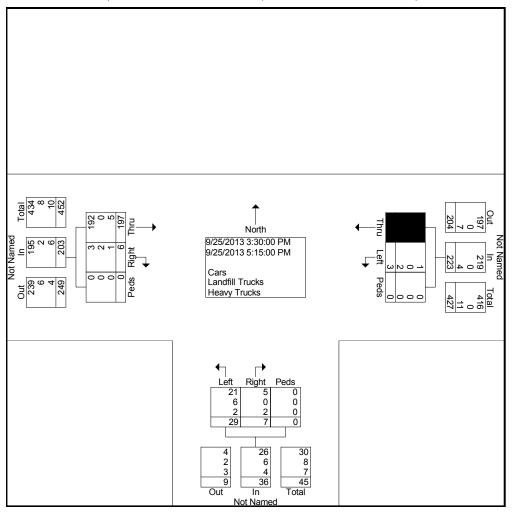
PM Count

File Name: BREWRO~1 Rochester, NY 14614 Site Code : 00000003 Start Date : 9/25/2013

Page No : 1

Groups Printed- Cars - Landfill Trucks - Heavy Trucks

		Fr	om No	orth			F	rom E	ast			Fr	om Sc	outh			Fr	om W	'est		
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.
Time	ht	u		S	Total	ht	u		S	Total	ht	u		S	Total	ht	u		S	Total	Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
03:30 PM	0	0	0	0	0	0	28	2	0	30	1	0	8	0	9	3	19	0	0	22	61
03:45 PM	0	0	0	0	0	0	23	1	0	24	0	0	2	0	2	1	30	0	0	31	57
Total	0	0	0	0	0	0	51	3	0	54	1	0	10	0	11	4	49	0	0	53	118
															'					'	
04:00 PM	0	0	0	0	0	0	31	0	0	31	2	0	10	0	12	1	27	0	0	28	71
04:15 PM	0	0	0	0	0	0	22	0	0	22	0	0	3	0	3	1	23	0	0	24	49
04:30 PM	0	0	0	0	0	0	29	0	0	29	1	0	2	0	3	0	31	0	0	31	63
04:45 PM	0	0	0	0	0	0	29	0	0	29	0	0	2	0	2	0	15	0	0	15	46
Total	0	0	0	0	0	0	111	0	0	111	3	0	17	0	20	2	96	0	0	98	229
					- 1															1	
05:00 PM	0	0	0	0	0	0	37	0	0	37	0	0	1	0	1	0	23	0	0	23	61
05:15 PM	0	0	0	0	0	0	21	0	0	21	3	0	1	0	4	0	29	0	0	29	54
Grand											_										
Total	0	0	0	0	0	0	220	3	0	223	7	0	29	0	36	6	197	0	0	203	462
							98.				19.		80.				97.				
Apprch %	0.0	0.0	0.0	0.0		0.0	7	1.3	0.0		4	0.0	6	0.0		3.0	٥/.	0.0	0.0		
							47.				-		U				42.				
Total %	0.0	0.0	0.0	0.0	0.0	0.0	47. 6	0.6	0.0	48.3	1.5	0.0	6.3	0.0	7.8	1.3	42. 6	0.0	0.0	43.9	
							ь										ь			ļ	



Barton & Loguidice, P.C. 11 Centre Park

Brew Road PM Count 11 Centre Park Suite 203 Rochester, NY 14614

File Name: BREWRO~1 Site Code: 00000003 Start Date: 9/25/2013

Page No : 2

		Fr	om No	orth			F	rom E	ast			Fr	om Sc	outh			Fı	om W	'est		
Start	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Rig	Thr	Left	Ped	App.	Int.
Time	ht	u	LCIL	s	Total	ht	u	Leit	S	Total	ht	u	Leit	s	Total	ht	u	Leit	s	Total	Total
Peak Hour I	rom 0	3:30 F	PM to	05:15	PM - P6	eak 1 d	of 1														
Intersecti on	03:45	PM																			
Volume	0	0	0	0	0	0	105	1	0	106	3	0	17	0	20	3	111	0	0	114	240
Percent	0.0	0.0	0.0	0.0		0.0	99. 1	0.9	0.0		15. 0	0.0	85. 0	0.0		2.6	97. 4	0.0	0.0		
04:00 Volume	0	0	0	0	0	0	31	0	0	31	2	0	10	0	12	1	27	0	0	28	71
Peak																					0.845
Factor																					
High Int.	3:15:0	00 PM				04:00					04:00	PM				03:45					
Volume	0	0	0	0	0	0	31	0	0	31	2	0	10	0	12	1	30	0	0	31	
Peak										0.85					0.41					0.91	
Factor										5					7					9	

APPENDIX C

Mill Seat Landfill Truck Ticket Data

11.14 1242.022.013

2012

	2012	
Ticket Date	Load	Total Tons
Ticket Date	Load 241	4283.03
11/16/2012	221	4070.89
8/16/2012	247	3997.88
10/5/2012	238	3906.62
10/3/2012	251	3893.46
10/3/2012	244	3863.59
7/27/2012	213	3743.73
7/18/2012	219	3719.37
8/7/2012	210	3671.91
11/27/2012	240	3655.82
11/15/2012	209	3591.55
8/8/2012	214	3543.71
10/4/2012	223	3462.01
7/17/2012	217	3437.59
5/9/2012	196	3390.36
12/10/2012	213	3357.08
10/1/2012	211	3356.81
12/14/2012	207	3316.57
12/12/2012	213	3303.01
12/17/2012	207	3300.34
10/26/2012	216	3289.49
11/26/2012	216	3233.2
10/8/2012	209	3128.77
1/10/2012	201	3126.71
8/23/2012	204	3103.74
7/13/2012	208	3097.53
7/9/2012	202	3056.87
7/30/2012	194	3042.72
7/12/2012	201	3021.97
12/18/2012	193	3015.89
5/16/2012	195	3012.48
8/22/2012	202	3011.72
11/19/2012	194	3010.09
10/9/2012	196	2996.67
8/29/2012	193	2985.88
7/25/2012	211	2975.46
11/14/2012	185	2960.1
9/26/2012	203	2959.08
5/8/2012	178	2954.95
9/6/2012	172	2953.02
11/6/2012	200	2944.74
2/20/2012	184	2935.65
8/10/2012	186	2931.92
5/1/2012	189	2916.1
11/30/2012	194	2904.59
8/21/2012	203	2893.01
5/2/2012	175	2875.63
11/20/2012	187	2859.2
12/7/2012	187	2855.07
7/11/2012	192	2853.65
8/30/2012	184	2848.23
10/18/2012	185	2834.16
2/7/2012	173	2823.07
	I	

2012 Most Trucks.

Ticket Date	Load	Total Tons
10/3/2012	251	3893.46
8/16/2012	247	3997.88
10/2/2012	244	3863.59
11/16/2012	241	4283.03
11/27/2012	240	3655.82
10/5/2012	238	3906.62
10/4/2012	223	3462.01
12/19/2012	221	4070.89
7/18/2012	219	3719.37
7/17/2012	217	3437.59

2012 Most Tons

Ticket Date	Load	Total Tons
11/16/2012	241	4283.03
12/19/2012	221	4070.89
8/16/2012	247	3997.88
10/5/2012	238	3906.62
10/3/2012	251	3893.46
10/2/2012	244	3863.59
7/27/2012	213	3743.73
7/18/2012	219	3719.37
8/7/2012	210	3671.91
11/27/2012	240	3655.82

r	T	1
11/9/2012	180	2821.55
2/21/2012	193	2820.6
7/2/2012	190	2817.25
5/24/2012	197	2813.38
11/23/2012	184	2807.2
5/17/2012	184	2806.32
5/31/2012	184	2799.41
8/13/2012	191	2795.62
8/27/2012	199	2793.03
7/10/2012	190	2793.03
11/28/2012	189	2792.67
10/11/2012	189	2791.93
8/20/2012	187	2791.89
12/26/2012	177	2776.86
9/7/2012	171	2775.7
8/24/2012	193	2774.87
10/22/2012	182	2773.14
9/4/2012	186	2772.73
8/14/2012	191	2770.98
12/4/2012	176	2768.65
8/28/2012	181	2767.65
8/17/2012	175	2767.5
3/1/2012	175	2764.57
12/3/2012	186	2755.06
11/13/2012	177	2755.05
12/11/2012	175	2754.97
9/5/2012	174	2750.58
3/29/2012	178	2744.68
11/29/2012	185	2743.25
8/6/2012	176	2737.05
10/23/2012	185	2735.03
7/3/2012	178	2723.54
6/29/2012	182	2722.88
10/25/2012	187	2718.88
6/22/2012	177	2705.92
4/24/2012	170	2705.31
7/24/2012	188	2703.98
5/30/2012	179	2691.87
10/24/2012	179	2681.65
7/5/2012	186	2680.32
11/21/2012	181	2668.51
8/2/2012	177	2666.97
6/1/2012	171	2665.14
5/25/2012	164	2664.52
4/11/2012	183	2660.73
2/8/2012	184	2652.32
9/24/2012	173	2642.2
6/18/2012	173	2627.27
8/15/2012	177	2622.95
5/18/2012	168	2622.93
2/2/2012	168	2620.64
6/28/2012	188	2619.15
6/14/2012	188	2615.3
12/5/2012	175	2607.46
9/19/2012	178	2604.52
3/16/2012	165	2603.46

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7/20/2012	182	2595.59
4/6/2012	158	2592.73
5/10/2012	166	2590.84
12/13/2012	172	2584.39
9/28/2012	168	2583.23
9/10/2012	176	2578.39
5/23/2012	175	2571.75
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7/19/2012	184	2568.18
11/1/2012	168	2567.84
6/26/2012	189	2567.29
11/7/2012	187	2564.4
9/18/2012	164	2564.38
5/3/2012	165	2563.13
11/8/2012	196	2555.01
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6/4/2012	163	2548.64
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8/1/2012	165	2544.4 2543.63
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6/13/2012	168	2537.69
11/2/2012	164	2518.31
4/10/2012	176	2512.27
6/19/2012 9/21/2012	164 179	2511.55 2508.55
6/27/2012	177	2508.33
1/11/2012	174	2506.05
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5/11/2012	164	2474.53
6/15/2012	159	2470.32
9/27/2012	185	2469.89
4/25/2012	164	2468.5
9/12/2012	182	2462.45
10/29/2012	156	2461
8/3/2012	163	2460.3
3/21/2012	157	2458.64
6/8/2012	166	2456.17
11/12/2012	167	2456.07
1/24/2012	165	2455.43
6/21/2012	168	2449
9/11/2012	160	2447.49
1/18/2012	165	2445.51
4/17/2012	170	2437.9
6/7/2012	170	2436.84
6/20/2012	160	2433
2/9/2012	175	2429.82
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3/15/2012	166	2425.48

5/4/2012	151	2420.99
3/26/2012	167	2420.01
12/31/2012	157	2419.73
2/16/2012	171	2417.95
6/5/2012	153	2416.07
8/9/2012	175	2412.77
3/22/2012	160	2409.31
10/15/2012	166	2408.31
1/16/2012	154	2383.93
3/14/2012	158	2367
7/6/2012	156	2363.5
4/20/2012	172	2354.72
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10/19/2012	160	2347.05
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6/25/2012	173	2333.42
5/22/2012	167	2329.77
4/16/2012	160	2327.87
6/11/2012	165	2327.06
7/26/2012	164	2326.34
10/12/2012	162	2318.11
3/28/2012	155	2317.13
1/17/2012	154	2302
9/17/2012	175	2294.35
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3/2/2012	142	2225.84
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1/19/2012	156	2216.55
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3/12/2012	157	2208.75
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1/23/2012	158	2195.24
4/27/2012	152	2191.25
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4/5/2012	156	2140.44
3/13/2012	154	2137.12
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1/30/2012	142	2117.79
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3/27/2012	138	2095.85
4/23/2012	130	2072.61

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12/28/2012 124 2015.73 4/3/2012 145 2005.44 2/15/2012 139 2001.42 1/6/2012 138 1992.94 2/14/2012 158 1977.62 2/10/2012 143 1948.43 2/28/2012 144 1929.03 2/17/2012 135 1927.4 1/5/2012 140 1921.56 2/2/2/2012 145 1916.41 1/27/2012 131 1914.12 1/9/2012 139 1861.93 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/9/2012 124 1823.82 1/20/2012 128 1786.29 10/16/2012 135 1777.79 2/2/2/2012 143 1735.71 2/2/2/2012 143 1735.71 2/23/2012 128 1714.1 2/23/2012 128 1612.33 1/4	1/12/2012	139	2031.61
4/3/2012 145 2005.44 2/15/2012 139 2001.42 1/6/2012 138 1992.94 2/14/2012 158 1977.62 2/10/2012 143 1948.43 2/28/2012 144 1929.03 2/17/2012 135 1927.4 1/5/2012 140 1921.56 2/22/2012 145 1916.41 1/27/2012 131 1914.12 1/9/2012 139 1861.93 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/9/2012 124 1823.82 1/20/2012 128 1766.29 2/27/2012 143 1735.71 2/24/2012 115 1728.89 3/5/2012 128 174.1 2/23/2012 <td>1/26/2012</td> <td>145</td> <td>2025.44</td>	1/26/2012	145	2025.44
2/15/2012 139 2001.42 1/6/2012 138 1992.94 2/14/2012 158 1977.62 2/10/2012 143 1948.43 2/28/2012 144 1929.03 2/17/2012 135 1927.4 1/5/2012 140 1921.56 2/22/2012 145 1916.41 1/27/2012 131 1914.12 1/9/2012 139 1861.93 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/9/2012 124 1823.82 1/20/2012 138 1777.79 2/27/2012 143 1735.71 2/24/2012 115 1728.89 3/5/2012 128 174.1 2/3/2012 128 1612.13 1/3/2012 <td>12/28/2012</td> <td>124</td> <td>2015.73</td>	12/28/2012	124	2015.73
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2/14/2012 158 1977.62 2/10/2012 143 1948.43 2/28/2012 144 1929.03 2/17/2012 135 1927.4 1/5/2012 140 1921.56 2/22/2012 145 1916.41 1/27/2012 131 1914.12 1/9/2012 139 1861.93 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/9/2012 124 1823.82 1/20/2012 128 1786.29 10/16/2012 135 1777.79 2/27/2012 143 1735.71 2/24/2012 115 1728.89 3/5/2012 128 1714.1 2/23/2012 124 1643.91 1/3/2012 138 1630.86 3/6/2012 128 1612.13 1/4/2012 132 1609.9 12/24/2012 13 1521.62 4/9/2012 </td <td>2/15/2012</td> <td>139</td> <td>2001.42</td>	2/15/2012	139	2001.42
2/10/2012 143 1948.43 2/28/2012 144 1929.03 2/17/2012 135 1927.4 1/5/2012 140 1921.56 2/22/2012 145 1916.41 1/27/2012 131 1914.12 1/9/2012 139 1861.93 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/9/2012 124 1823.82 1/20/2012 128 1786.29 10/16/2012 135 1777.79 2/27/2012 143 1735.71 2/24/2012 115 1728.89 3/5/2012 128 1714.1 2/23/2012 124 1643.91 1/3/2012 138 1630.86 3/6/2012 128 1612.13 1/4/2012 132 1609.9 12/24/2012 133 1521.62 4/9/2012 85 1373.87 6/2/2012 <td>1/6/2012</td> <td>138</td> <td>1992.94</td>	1/6/2012	138	1992.94
2/28/2012 144 1929.03 2/17/2012 135 1927.4 1/5/2012 140 1921.56 2/22/2012 145 1916.41 1/27/2012 131 1914.12 1/9/2012 139 1861.93 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/9/2012 124 1823.82 1/20/2012 128 1786.29 10/16/2012 135 1777.79 2/27/2012 143 1735.71 2/24/2012 115 1728.89 3/5/2012 128 1714.1 2/23/2012 124 1643.91 1/3/2012 138 1630.86 3/6/2012 138 1630.86 3/6/2012 138 1630.86 3/6/2012 138 1630.86 3/6/2012 132 1609.9 12/24/2012 13 1521.62 4/9/2012 <td>2/14/2012</td> <td>158</td> <td>1977.62</td>	2/14/2012	158	1977.62
2/17/2012 135 1927.4 1/5/2012 140 1921.56 2/22/2012 145 1916.41 1/27/2012 131 1914.12 1/9/2012 139 1861.93 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/9/2012 124 1823.82 1/20/2012 128 1786.29 10/16/2012 135 1777.79 2/27/2012 143 1735.71 2/24/2012 115 1728.89 3/5/2012 128 1714.1 2/23/2012 124 1643.91 1/3/2012 133 1630.86 3/6/2012 138 1630.86 3/6/2012 138 1630.86 3/6/2012 138 1630.86 3/6/2012 138 1630.86 3/6/2012 132 1609.9 12/24/2012 13 1521.62 4/9/2012	2/10/2012	143	1948.43
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2/22/2012 145 1916.41 1/27/2012 131 1914.12 1/9/2012 139 1861.93 3/8/2012 129 1852.93 1/31/2012 140 1841.59 2/1/2012 134 1828.17 3/9/2012 124 1823.82 1/20/2012 128 1786.29 10/16/2012 135 1777.79 2/27/2012 143 1735.71 2/24/2012 115 1728.89 3/5/2012 128 1714.1 2/23/2012 124 1643.91 1/3/2012 138 1630.86 3/6/2012 138 1630.86 3/6/2012 138 1630.86 3/6/2012 132 1609.9 12/24/2012 131 1521.62 4/9/2012 85 1373.87 6/2/2012 55 1254.24 9/8/2012 63 1243.15 1/2/27/2012 59 109.86 1/1/3/2012 <td>2/17/2012</td> <td>135</td> <td>1927.4</td>	2/17/2012	135	1927.4
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	5/19/2012	19	133.46

6/23/2012	20	131.25
10/6/2012	23	119.15
7/28/2012	18	116.29
12/1/2012	16	108.9
9/15/2012	17	105.39
9/22/2012	13	96.28
10/13/2012	18	94.05
7/14/2012	14	93.13
4/7/2012	17	88.92
2/4/2012	12	84.68
5/12/2012	15	79.05
12/8/2012	14	78.1
3/10/2012	11	74.28
7/21/2012	10	72.33
4/14/2012	17	70.51
1/21/2012	11	70.43
3/31/2012	13	70.14
3/24/2012	12	69.14
6/16/2012	18	67.8
2/11/2012	10	66.63
1/28/2012	10	63.06
6/9/2012	10	62.63
3/17/2012	13	61.66
1/7/2012	10	61.47
4/28/2012	12	60.17
4/21/2012	11	57.96
2/18/2012	11	57.53
1/14/2012	8	56.5
2/25/2012	9	55.36

Truck Traffic during Cell Construction September 23-27, 2013

Stone and Clay Trucks only

<u>Date</u>	# Trucks
9/23/2013	16
9/24/2013	58
9/25/2013	38
9/26/2013	52
9/27/2013	58
_	222

APPENDIX D

Traffic Computations

11.14 1242.022.013



JOB MUL	SEAT LF			
SHEET NO	1	OF	29	
CALCULATED BY	JMW	_DATE	12/17/2	013
CHECKED BY	MCB	_DATE	11-5-1	. 4
DESCRIPTION	IN TERESON	10101	COUNT	SUMMAN

33A /	JAN WY		EXI	ST	N	57		ı	USE	PHE	FRO	OM	TUR	N MC	VEMI	NT CC	UNTS
334/	770 00	2		3.1								•					
AM	NT	200	,	11	2		7'	A	. 8	100	A- N	٨					
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		V15	/ DY A	4 1	0 A =			41	20	2~	2 =		27	4 1	613		
		PHE												I IRO V			
			RUCK														
			TR	175-55			1.140	<i>\(\)</i>		- 1			UPH				
				V = P	-5					Autorit		7	V 1 JP8	***********			
	EBT	V	= 4	128	VI	0,+											
		V1 8	-	120	× 4/	=	48	0	191	4							
		01	F	113	a /	440	1	7	e	29	_		0	94			
		0/	TRU	10	2	3	3 /	10	S	22		7.	50				
			= 72														
			116	No han plan	5			1_1_1									
	MET	1			_	93	3 V	4.4									
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		PHI	-			30	/		-	0	7	Q		0.75			
			Ruck														
			TRUC														
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		91	F		Marie No.		16			. 6		_a	0.78	3			
		%	TRUCI	K S	=	18	1		16	0 4	1/0						
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		PHI			Ł		2 1							_			
		%	TRUC	K S	2		12	-									
			TRU				V										



JOB MILL	SCAT 1	F		
SHEET NO	2	OF	29	
CALCULATED BY_	JMW	DATE_	12/17/	2013
CHECKED BYI				
				Sumprey

IPM INT	Prov.				^		
LPM INT	PEAK HO	40000		1	1		
	V ₁₅		986 UP		1917		
	PHF	1 1	886/916	1			
	% TRUCK						
	LF TRUCK	<u> </u>	1				
			202 40				
GBT	V V ₁ 5		383 YP		/16/7		
	AIF		383/45		1	0.84	
			14 383				
	LF TRUCK						
LIO T			1= ,191				
WBT	V		47 x 4 =	99	1011		
	PHF		150/188			0.79	
			4/150				
	LF TRU	= كــــــــــــــــــــــــــــــــــــ					
SBL	V		B 194				
			D × 4 =	BUPH			
	VI 5 PAF	=	3/8 =	0.38			
	% TRUCK		0/3 =	1 1			
	LF TRUL	ks =	0				
SBR	V		350 U	PI+			
	V15		102 x 4		VPH		
	PHE		350 140			0.84	
			6/350	= 1.7	%		
	LF TRUCK	5 =	0				



JOB MILL	SCAT	LF		
SHEET NO	3	OF	29	
CALCULATED BY	JMW	DATE	12/17/201	3
CHECKED BY			11-5-14	
PERCEIPTION LI				

	EB - EXISTING	
AM) INT	PEAK HOUR	7.00-8.00 AM
	V	259 UPH (ACTUAL WAS 254)
	V15 =	73 7 = 292 UPIT
	PIFF	259/291/ 0.88
		29/259 = 11.2%
	LF TRUCKS =	26 VPH
EB7	. 🗸 🗀	123 UPH (ACTUAL WAS 122)
		3474 = 136 194
,	PHF .	103 / 136 - 0.90 0.89
	% TRUCKS =	11/123 = 8.9%
	LF TRUKES =	10 VP4
ws-	T V =	LOG UPIT CACTURE WAS 100)
	V15 =	30 × 4 = 120 VPH
	Put	156/130 = 0.88 0.87
		15/106 = 14.2%
		13 VPH
NBL	J	22 494
		8 × 4 = 32 1914
	PHF	0.75
	"ToTeurs -	0/02 = 0%
	LF TRUCKS =	DVPIT
NSR	_	8 491+
	V15 -	D x 4 = 8 1814
	PHE =	8 / 8 = 1.5 0.75
	% TRUCKS =	
	LF TRUCKS =	3 VPIH



JOB MILL	SCAT	LF		
SHEET NO	4	OF	29	
CALCULATED BY_	JMW	DATE_	12/17/2	0013
CHECKED BY	MCB	DATE_		
55000000000	LITERS	SCTIANI	CALLATT	SUMMA ARV

33A	490 €	3 - EXISTING	*		
(PM)	TUI	PEAK HOUR	3:45-4:45	5 94	
		V =	276 UPH (AL
		V,5 :	79 × 4 = 31	6 VPH	
		A)E	276/36=		
		% TRUCKS =	9/276 =	3.3%	
		LF TRUCKS :	3		
	ERT	V 2	10H UPH (103	ACTUR	
		Vis :	28 × 4 = 112		
		PHT	104/112 = 0.9		8
		% TRUCKS	3 /104 = 3.	9%	
		LE TRUCKS	0		
	12-5				
	WBT	N N	124 JOH	0	
			43 × 4 = 16°		0.76
		% TRUCKS =	5/124 =		
		LE TRUKS :	2	9 a 7 a a a a a a a a a a a a a a a a a	
	NBL	J	38 VPH		
		V.5	17 × 4 = 68		
		PHF :		0.56	0.60
		9. TRUCKS =	0 %		
		LEOSES			
	NBR	J	10 1941		
	College April	J. 5	3 × 4 = 10 V		
		PHE			0.60
		YOTRULES =	1/0=10	%0	
		LT TRUKS			
		COLECTION &			LIGETION, SEE



JOB MILL	SCAT	LF		
SHEET NO	5	OF_	29	
CALCULATED BY_	JUW	DATE_	12/17/2	013
CHECKED BY	MCB			
	1.15/2 SC	MAN	CANAST	SUMMER RU

72	AFFIC	1	116	1-11			2 0	78	1	7-1	2	21	1.	192		.R	NE	e 1	2An	10
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	ALL	Tei	JCK S	(1	307	гн	H	Т	٤	LT)	6	JE-12	4	R	ec	08	DC-	D	A 5	
	1A556			100	1000										- 1					
	BOT					1														
	ADJ	ACG	151	Co	UN	TS		+7_		33	A /	Be	Eu	د	RD		A	Qu	-	
	331				7			- 1	1							211				
	ANT	1	HE	೦೮	CR	AL		Co	N - A	575		Fore		33	A/	40	10 2	EB		
	WE	1 1						1	- 1	1			1 -							
	127	1			1		- 1		1								CA	KD	سم	N
	AN.	D ī	218	TRI	8u-	10	~	CA	الم	30		AS	S.L	M	GO	١				
	T. L.						Λ.	7			1									
	117.6	= 4	OLL	سام	المال	7	B	250		-17	2.0.	5	Samuel	C-11	C C	(V	121) E '	1	
MAMI	->	10	1 T	-	R	(- Te	27		202	rem	CA	T								
		1 1-																		
		3																		
		13												7						
	-7			a	1 1	1														
	>	To	TAL	_ v	JB	T	w	AS	10	2	co	حدں	TED)_,_	Bu	T	12	CRE	18	6
			TO	100	•	工	7	36	(012	15	En	57	ايب	T1+	R	RE	w/	33 F	+
	→	To	TAL	G	13-	T	u:	A 5		9 3		3	1	1~	CR	EN	SE	٥.	70	
			123	S	To	73	E	C	سد	615	72	51	L	۱ د	TH	-	Ba	Ec	2/3	3 A
0.1						_													-	
PM)		347					12													
	<u> </u>	70		FOR	0	NE	K													
	7	3 .	-	10			B -	r												
	-3	10-	20.	70	12	7	10	5	10		2.	-	101	(4	-A	SEC	,	1011	7	
			2/	CON	212	-	4.57				2	26	11	2.7	Δ	0		10 -		
						-6	.150	1		17	0.1		1	_ر_د						



JOB MILL	- SEAT	LF		
SHEET NO	6	OF	29	
CALCULATED BY.	UMW	DATE	12/17/20	13
CHECKED BY	MCB	DATE		
DESCRIPTION	INTERSE	TION	60U 5T	SIMMARY

554/B	cen k	D - EXISTIA	3(4			
AM	TLAI	PEAK HOUR		71.00-8100	AM.	
		V		245 VP4		
		V15	=	64 x 4 =	256 784	
		PHF		245/256	= 0.96	
		% TRUCKS	=	1 1 21 1	- 15.1%	
		LF TRUCKS	1 1	26		
	EBT	V	-	112 Upit		
		V,5	-	32 × 4 "	128 UPH	
		PHT		112/108	- 0.38	- 0.93
		% TRUCKS	=	1/112:	0.190	
		LF TRUCKS	=	0		
	EBR	V		19 194		
		V,5	1,	11 × 4 =	44 114	
		PHE		19/44 =	0.43	0.93
		% TRUCKS	-	13/19=	68.4%	
		LF TRUCES	=	13		
	WBJ	V	-	92 VPH		
		V15	5	27 × 4	= 108 UPH	
		PHE	N-	92/102	085	0.90
		% TRICKS	F	2 192	= 0.3%	
		LF TEVELS	£	0		
	WBL	4	=	6 UPH		
		Vis	2	3 × 4 =	12 UPIT	
		PIFE	5	6/10	0.50	0.90
		% TRUCKS	٤	6/6=	100%	
		LFTRUKS	=	0		



JOB MILL	SCAT	LF	
SHEET NO	7	OF	76
CALCULATED BY	JMW	DATE_	12/17/2-13
CHECKED BY		DATE_	
I. V	TRACK!	T. O. 1	CAND T C. MARANY

33A/	BREW	RD - EXISTI	U4	(con	عر بر	red)		
[AM]	NBL	4	=	14 V	PI+			
		1/2	=	7×4		VP(+		
		PAF	Ren.	14/28			0.57	
		% TRUCKS	=	13 /14	_ 9	29%		
				13				
		LF TRUCKS		1.5				
	NBR	1	1	2 V44				
		1,5	= ,	2×4:	8	144		
		PHE		3/8=	0.2		0.57	
		% TRUCKS	2	2/2	E 100	9/8		
		LF TRUCKS		0				
			-					
			-					
						-		-
			-					



JOB MILL	SCAT	LF			
SHEET NO	8	OF	29		
CALCULATED BY_		DATE	12/17	12013	
CHECKED BY					
555555555	NTCDCGGT			SUMM ARV	ı

334/3	BREW F	D - EXISTI	المكام	
IPM	INT	PEAK HOUR		3:45-4:45 PM
		V	=	240 1814
		V, 5	-	71 × 4 = 284 JPH
		PAF	-	240/084 = 0.85
		1/2 TRUCKS	-	11/240= 4.6%
		LF TRUCKS	•	3
	EBT	V	4	13 VPH
	45	Vis	L	3174 - 124 484
		PHF	-	111 / 129 - 0.90 0.91
		% TRUCKS	=	3 /11 = 2.7%
		LF TexKS	8	6
	EBR	√	8	3 4917
		Vis		1 x 4 = 4 veH
		PHE	*	3/+ - 0.75 0.91
		% TRUCKS	-	1/3 = 33.8 %
		LF TRUCKS	*	
	WBT	V	-	05 UPH
		V15	e	31×4=124 VPH
		PINE	=	105/124 5 0.85 0.85
		%TRUES	3	1/105 = 0.9%
		%TRICKS IF TRUCKS	3	
	WBL		<u> </u>) VP1-
		11.5	-	1 2 4 = 4 1917
		V.5	-	1/4 70.5 0.85
		3/2 TRUCKS	-	1/1 = 100%
		LF TRUCKS		0



JOB MILL	SCAT	LF		
SHEET NO	9	OF_	29	
CALCULATED BY_	DMW	DATE_	10/17/	2015
CHECKED BY		DATE_		
DESCRIPTION	NTZRSC-C	TION	1000	SUMMARY

33A/	BREW	RD - EXIC	JING				
PMI	NBL	V	=	17 VPH			
		V	-		- 40 0814		
		414	_	17/40=		0.41	
		9- TRUCKS	-	4/17 =	335%		
			1-1-1-	2	33.		
		LF TRUCK	5	4			
	NBR	V	=	3 UPH			
		V15	=	ax4 =	8 UPH		
		PHF	-	3/8 -		0.41	
		1/6 TRUCK	5 =	1/3 -	1 1 1 1		
		LF TRUK		0			

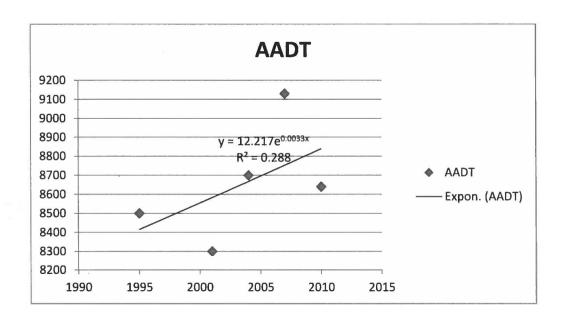


JOB MUL	SCAT LF		
SHEET NO	10	OF_	29
CALCULATED BY_	JMW	_DATE_	1103 0014
CHECKED BY	MCB		
DESCRIPTION:	BACHARA		

BACKGRO	UND TRAFFI	GROWTH ON ROUTE 33A
POUTE 33	TO COUNTY LI	JE (GENTSEE COUNTY)
*	y	
YCAR	PAIDT 0	
1995	8500	EX ONENTIAL TOGNOLINE:
200	8300	0,0033x
2004	8700	y = 12 217 e 0,0033x
2007	9130	J
2010	8640)	
		GROWTH = 0.33 % per year
COUNTY	INE TO ROUTE	36 (MONRUE COUNTY)
У	9	
YEAR	9007	
1995	2450	
1998	2450	EXPONENTIAL TRENDUNE:
2001	2615	0,0034
2604	2640	y = 2.7464 e
2007	2950	
ااهد	2390	
		GrowTH = 6.34 % por year
	USE 0.349	· per growth

YEAR	AADT
1995	8500
2001	8300
2004	8700
2007	9130
2010	8640

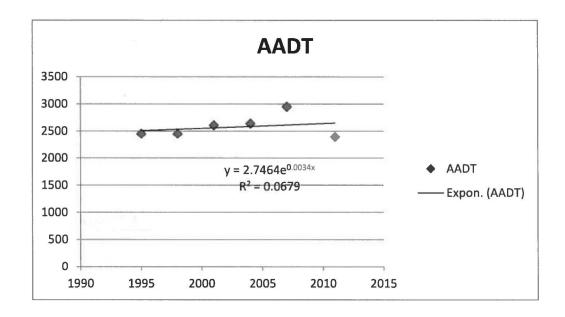
Genesee County from Route 33 to County Line



BACKGROUND GROWTH FORECAST

/EAR	AADT
1995	2450
1998	2450
2001	2610
2004	2640
2007	2950
2011	2390

Monroe County from County Line to Route 36



PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



Engineers • Environmental Scientists • Planners • Landscape Architects

ROAD NAME - 490 WB Off Ramp - AM Peak (P vehicles)

Growtl	h Rate =	1.5%				
	Year	EB (vph)	WB (vph)	SB Right (vph)	SB Left (vph)	Comments
0	2013	396	87	223	1	Existing Conditions
1	2014	402	88	226	1	-
2	2015	408	90	230	1	
3	2016	414	91	233	1	
4	2017	420	92	237	1	
5	2018	427	94	240	1	Begin Permit

PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



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ROAD NAME - 490 EB Off Ramp - AM Peak (P vehicles)

Growth	Rate =	1.5%				
	Vacu	EB	WB	NB Right	NB Left	
	Year	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	112	91	5	22	Existing Conditions
1	2014	114	92	5	22	
2	2015	115	94	5	23	
3	2016	117	95	5	23	
4	2017	119	97	5	23	
5	2018	121	98	5	24	Begin Permit

PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



Engineers • Environmental Scientists • Planners • Landscape Architects

ROAD NAME - Brew Road - AM Peak (P vehicles)

Growth	n Rate =	1.5%						
	Year	EBT	EBR	WBT	WBL	NB Right	NB Left	
	Teal	(vph)	(vph)	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	111	6	90	0	0	1	Existing Conditions
1	2014	113	6	91	0	0	1	
2	2015	114	6	93	0	0	1	
3	2016	116	6	94	0	0	1	
4	2017	118	6	96	0	0	1	
5	2018	120	6	97	0	0	1	Begin Permit

PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



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ROAD NAME - 490 WB Off Ramp - AM Peak (Heavy Trucks)

Growth	Rate =	1.5%				
	Vacu	EB	WB	SB Right	SB Left	
	Year	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	25	0	6	0	Existing Conditions
1	2014	25	0	6	0	
2	2015	26	0	6	0	
3	2016	26	0	6	0	
4	2017	27	0	6	0	
5	2018	27	0	6	0	Begin Permit

PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



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ROAD NAME - 490 EB Off Ramp - AM Peak (Heavy Trucks)

Growth	Rate =	1.5%				
	Year	EB	WB	NB Right	NB Left	
	Tear	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	1	2	0	0	Existing Conditions
1	2014	1	2	0	0	
2	2015	1	2	0	0	
3	2016	1	2	0	0	
4	2017	1	2	0	0	
5	2018	1	2	0	0	Begin Permit

PIN

JN 1242.022.013

Calc. By: JMW Checked: MCB Date: 12/17/2013

Date:



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ROAD NAME - Brew Road - AM Peak (Heavy Trucks)

Growth	Rate =	1.5%						
	Year	EBT	EBR	WBT	WBL	NB Right	NB Left	
	Teal	(vph)	(vph)	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	1	0	2	0	0	0	Existing Conditions
1	2014	1	0	2	0	0	0	
2	2015	1	0	2	0	0	0	
3	2016	1	0	2	0	0	0	
4	2017	1	0	2	0	0	0	
5	2018	1	0	2	0	0	0	Begin Permit

PIN

JN 1242.022.013

Calc. By: JMW Checked: $^{\mbox{\scriptsize MCB}}$ Date: 12/17/2013

Date:



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ROAD NAME - 490 WB Off Ramp - PM Peak (P vehicles)

Growth	Rate =	1.5%				
	Year	EB	WB	SB Right	SB Left	
	Tear	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	369	146	344	3	Existing Conditions
1	2014	375	148	349	3	
2	2015	380	150	354	3	
3	2016	386	153	360	3	
4	2017	392	155	365	3	
5	2018	398	157	371	3	Begin Permit

PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



Engineers • Environmental Scientists • Planners • Landscape Architects

ROAD NAME - 490 EB Off Ramp - PM Peak (P vehicles)

Growth	Rate =	1.5%				
	Vacu	EB	WB	NB Right	NB Left	
	Year	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	111	119	9	38	Existing Conditions
1	2014	113	121	9	39	
2	2015	114	123	9	39	
3	2016	116	124	9	40	
4	2017	118	126	10	40	
5	2018	120	128	10	41	Begin Permit

PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



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ROAD NAME - Brew Road - PM Peak (P vehicles)

Growth	Rate =	1.5%						
	Year	EBT	EBR	WBT	WBL	NB Right	NB Left	
	rear	(vph)	(vph)	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	108	2	104	0	2	13	Existing Conditions
1	2014	110	2	106	0	2	13	
2	2015	111	2	107	0	2	13	
3	2016	113	2	109	0	2	14	
4	2017	115	2	110	0	2	14	
5	2018	116	2	112	0	2	14	Begin Permit

PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



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ROAD NAME - 490 WB Off Ramp - PM Peak (Heavy Trucks)

Growth	n Rate =	1.5%				
	Year	EB	WB	SB Right	SB Left	
	rear	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	14	3	6	0	Existing Conditions
1	2014	14	3	6	0	
2	2015	14	3	6	0	
3	2016	15	3	6	0	
4	2017	15	3	6	0	
5	2018	15	3	6	0	Begin Permit

PROJECT NAME: MILL SEAT LANDFILL

PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



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ROAD NAME - 490 EB Off Ramp - PM Peak (Heavy Trucks)

Growth	n Rate =	1.5%				
	Year	EB	WB	NB Right	NB Left	
	I cai	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	3	3	0	0	Existing Conditions
1	2014	3	3	0	0	
2	2015	3	3	0	0	
3	2016	3	3	0	0	
4	2017	3	3	0	0	
5	2018	3	3	0	0	Begin Permit

PROJECT NAME: MILL SEAT LANDFILL

PIN

JN 1242.022.013

Calc. By: JMW **Date:** 12/17/2013

Checked: MCB Date:



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ROAD NAME - Brew Road - PM Peak (Heavy Trucks)

Growth	n Rate =	1.5%						
	Year	EBT	EBR	WBT	WBL	NB Right	NB Left	
	i eai	(vph)	(vph)	(vph)	(vph)	(vph)	(vph)	Comments
0	2013	3	0	1	0	0	2	Existing Conditions
1	2014	3	0	1	0	0	2	
2	2015	3	0	1	0	0	2	
3	2016	3	0	1	0	0	2	
4	2017	3	0	1	0	0	2	
5	2018	3	0	1	0	0	2	Begin Permit



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JOB MILL	SCAT L	F		
SHEET NO	25	OF	99	
CALCULATED BY	JMW	DATE	1103/2014	
CHECKED BY	MOD	DATE		
DESCRIPTION		E-RAT	102	

MAX T	PALLY TR	AFPIC =	= 286				
	- DAILY			9/25/1	3 = 16:	o vpd	
PEAK +	HOUR GENT	247104	TRAPAC	Fron	1 Exis	TLNG	COUNTS
BREW	RD /331	9					
IAMI	NBL =	13 L T	× 286/	160 =	= 23 L	т (10 LT)
	EBR =	13 LT ×	286/10	62 =	23	LT	(10)
[PM]	NBL=	J LT x	286/1	6> =	4 6	7	(7)
	EBR =	ILT &	296	162 =	2 L	7	(1)
490 E.	13 / 33A						
[AM]	NBR =	3 LT	x 2846	/162	- 5	U	(a)
	EBT =	10 LT	× 286	/162	- 18	17	(8)
	WBT=	13 LT	× 286	/162	= 23	LT	(10)
PMI	NBR =	1 LT	v 186	1162	= 2	LT	(1)
	EBT =	OLT	> 286	162	= 0	LT	(0)
	WBT =	2 LT	× 18k	0/162	= 4)	LT	(2)



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JOB MILL	SCAT	LF	
SHEET NO	26	OF	29
CALCULATED BY	JMW	DATE	1103/2014
CHECKED BY	MCB	DATE	
			2=1

490 W	B 1334)					
IAMI	5BL	= 10 LT	×	286/162	= 18	LT	(8)
	EBT	= 7 LT	×	286/163	= 12	LT	(5)
	WBT	= 6 LT	×	286/162	= [[C 1	(5)
PM	58L :	O LT	*	286/162	e 0	LT	(6)
	EBT =	OLT	Х	286/162	<i>z</i> 0	LT	(0)
	WBT =	1 LT	4	286/163	: 2	L1	(1)
			-				



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JOBM	LL SEAT	CF		
SHEET NO	27	OF	29	
CALCULATED BY_	JMW	DATE	1/23/20	14
CHECKED BY	MCB	DATE		
		· daa-	- 1	

CONSTR	UCTION	TRAFFIC	- GENERAT	101
MAX T	DAILY TR	AFFIC = 75	rod CMWN.	4)
ACTUAL	- DAILY T	RAFFIC FOR	9/25/13 =	: 38 Nbg
PEAK	HOUR (Journes Est	MATED FR	on Existing courts
BREW	M /33A			
[AM]			7-5	
	WBL =	6 CV x =	38 = 12 (CV (ADDITIONAL 6)
	NBR =	a cv x ⁷	5/38 = 4	CV (ADDITIONAL >)
IPMI				
	WBL =	1 CV x 73	738 = 2 C	U (ADDITIONALI)
	NBR=	1 cv x 7	5/38 = 2	CU (ADDITIONALI)

PERCEN	T TRUCKS -	BACKGRO	UND		T	
490 EB		V	HV+LF+CV	% TRUCKS		
AM	NBL	25	0	0%		
	NBR	9	3	33%		
	EBT	139	11	8%		
	WBT	119	15	13%		
PM	NBL	43	0	0%		
	NBR	11	1	9%		
	EBT	130	3	2%		10 (2) 1.
	WBT	141	5	4%		
490 WB						
AM	SBL	11	10	91%		
	SBR	262	7	3%	22	
	EBT	492	36	7%		
	WBT	105	6	6%		
DNA	CDI		0			
PM	SBL	3	7	0%		
	SBR	400		2%	 	
	EBT	437	16	4%		
	WBT	171	4	2%		
BREW						
AM	NBL	14	13	93%		
	NBR	2	2	100%		
	EBT	128	1	1%		
	EBR	20	13	65%		
	WBT	105	2	2%		
	WBL	6	6	100%		
D14	L L L	-	_	0001		
PM	NBL	19	5	26%	1	
	NBR	3	1	33%		
	EBT	126	3	2%	1	
	EBR	3	1	33%	1	
	WBT	120	1	1%		
	WBL	1	1	100%		

PERCEN	TTRUCKS -					<u> </u>	
			KGROUND			ECTED	L
490 EB		V	HV+LF+CV	Generation	Total V	Total Trucks	% TRUCKS
AM	NBL	25	0		25	0	0%
	NBR	9	3	2	- 11	5	45%
	EBT	139	11	8	147	19	13%
	WBT	119	15	10	129	25	19%
PM	NBL	43	0		43	0	0%
	NBR	11	1	1	12	2	17%
	EBT	130	3	0	130	3	2%
	WBT	141	5	2	143	7	5%
490 WB			0				
AM	SBL	11	10	8	19	18	95%
	SBR	262	7		262	7	3%
	EBT	492	36	5	497	41	8%
	WBT	105	6	5	110	11	10%
PM	SBL	3	0		3	0	0%
	SBR	400	7		400	7	2%
iV.	EBT	437	16		437	16	4%
	WBT	171	4	2	173	6	3%
BREW			0				
AM	NBL	14	13	10	24	23	96%
0.000000	NBR	2	2	2	4	4	100%
	EBT	128	1		128	1	1%
	EBR	20	13	10	30	23	77%
	WBT	105	2		105	2	2%
	WBL	6	6	6	12	12	100%
PM	NBL	19	5	2	21	7	33%
	NBR	3	1	1	4	2	50%
	EBT	126	3		126	3	2%
	EBR	3	1	1	4	2	50%
*	WBT	120	1		120	1	1%
	WBL	1	1	1	2	2	100%
	1						

APPENDIX E

Capacity Analysis – Existing Conditions

11.14 1242.022.013

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: Existing
Project ID: Mill Seat Landfill
East/West Street: Route 33A

North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

					_	_			
		icle Vol			stme				
Major Street:	Approach		stboun	-			Testbou -	-	
	Movement	1	2	3	!	4	5	6	
		L	Т	R	ı	L	Т	R	
Volume			428				93		
Peak-Hour Fact	or, PHF		0.94				0.7	5	
Hourly Flow Ra	•		455				124		
Percent Heavy									
Median Type/St	corage	Undiv	vided			/			
Lanes	•		2				2		
Configuration			T				T		
Upstream Signa	112		No				No		
oppereum bigne			110				110		
Minor Street:	Approach	No	rthbou	nd			Southbo	und	
	Movement	7	8	9	- 1	10	11	12	
		L	Т	R		L	Т	R	
Volume						10		229	
Peak Hour Fact	or, PHF					0.78	}	0.78	3
Hourly Flow Ra	ite, HFR					12		293	
Percent Heavy	Vehicles					100		3	
Percent Grade			0				0		
Flared Approac	h: Exists?	/Storage	9		/				/
Lanes						1	_	1	
Configuration							L	R	
	Delay,	Queue Le	enath,	and Lev	el o	f Ser	vice		
Approach	EB	WB	-	rthboun				uthbound	 d
Movement	1	4	7	8	9	1	10	11	12
Lane Config		Ĺ				i	L		R
v (vph)							12		293
C(m) (vph)							419		999
V/C							0.03		0.29
95% queue leng	gth						0.09		1.23
Control Delay							13.8		10.1
LOS							В		В
Approach Delay	7							10.2	
Approach LOS								В	

Phone: E-Mail:

_____TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____

Fax:

Analyst: Jonathan Walczak

Agency/Co.: Agency/Co.: Barton & Loguidice, P.C. Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: Existing Project ID: Mill Seat Landfill East/West Street: Route 33A
North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

	_Vehicle	Volumes	and	Adjustmen	ts		
Major Street Movements	1	2	3	4	5	6	
	L	T	R	L	Т	R	
Volume		428			93		
Peak-Hour Factor, PHF		0.94			0.75		
Peak-15 Minute Volume		114			31		
Hourly Flow Rate, HFR		455			124		
Percent Heavy Vehicles							
Median Type/Storage RT Channelized?	Und	ivided		/			
Lanes		2			2		
Configuration		Т			T		
Upstream Signal?		No			No		
Minor Street Movements	7	8	9	10	11	12	
	L	Т	R	L	Т	R	
Volume				10		229	
Peak Hour Factor, PHF				0.78		0.78	
Peak-15 Minute Volume				3		73	
Hourly Flow Rate, HFR				12		293	
Percent Heavy Vehicles				100		3	
Percent Grade (%)		0			0		
Flared Approach: Exist	s?/Stora	ge		/			/
RT Channelized?						No	
Lanes				1		1	
Configuration				L	R		

	Pedestrian	Volumes	and Ad	justments_	
Movements	13	14	15	16	
Flow (ped/hr)	0	0	0	0	

Lane Width (ft) 12.0 12.0 12.0 12.0 Walking Speed (ft/sec) 4.0 4.0 4.0 4.0 Percent Blockage 0 0 0 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time Length Speed to Signal Flow Flow Type feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared in volume, major th vehicles: Shared in volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	Gap Cal	culatio	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(c,base	:)						7.5		6.2
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent t(3,1t)	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage						8.8		6.3
Follow-U	p Time C	alculat	ions						
Movement	-	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(f,base t(f,HV) P(HV) t(f)	•)	1.00	1.00	1.00	1.00	1.00	3.50 1.00 100 4.5	1.00	3.30 1.00 3 3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

V prog

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                               Τ
                                                      R
                                                             L
                                                                            R
                                                             351
                                                                            62
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

∇(c,x)		
s	3000	
P(x)		
V(c,u,x)		
C(r,x)		
C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ıs	
Chan 1. Dm from Minor Ch	<u>-</u>	
Step 1: RT from Minor St.	9	12
Conflicting Flows		62
Potential Capacity		999
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		999
Probability of Queue free St.	1.00	0.71
Step 2: LT from Major St.	4	
seep 2. II IIom major be.	-1	±
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1 00	1 00
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	1.00	
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		
Potential Capacity		419
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.71	1.00
Movement Capacity		419
Workshoot 7 Computation of the Effect of E		
Worksheet 7-Computation of the Effect of Tv	oo staye Gap ACC	= Prance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		

Stage1 Stage2 Stage1 Stage2 Stage1 Stage2 Stage1 Stage2

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity					
Part 3 - Single Stage Conflicting Flows Potential Capacity					
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity		1.00		1.00	
Result for 2 stage process: a y					
C t Probability of Queue free St.		1.00		1.00	
Step 4: LT from Minor St.		7		10	
Part 1 - First Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity Part 3 - Single Stage					
Conflicting Flows Potential Capacity				351 419	
Pedestrian Impedance Factor Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor. Cap. Adj. factor due to Impeding mymnt Movement Capacity		1.00 1.00 1.00 0.71		1.00	
Results for Two-stage process:					
а У					
C t				419	
Worksheet 8-Shared Lane Calculations					
Movement 7	_	9 R	10 L	11 T	12 R
Volume (vph) Movement Capacity (vph) Shared Lane Capacity (vph)			12 419		293 999

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	Т	R
C sep Volume Delay Q sep Q sep +1 round (Qsep +1)				419 12		999 293
n max C sh SUM C sep n C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	<u>_</u>	4	7	8	9	10	11	12
Lane Config						L		R
v (vph)						12		293
C(m) (vph)						419		999
v/c						0.03		0.29
95% queue length						0.09		1.23
Control Delay						13.8		10.1
LOS						В		В
Approach Delay		10.2						
Approach LOS							В	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: PM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: Existing
Project ID: Mill Seat Landfill
East/West Street: Route 33A

North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

					_	_			
		nicle Vol			stme				
Major Street:	Approach	_	stbound				Vestbou	-	
	Movement	1	2	3		4	5	6	
		L	T	R		L	Т	R	
 Volume			383				150		
Peak-Hour Fact	or, PHF		0.84				0.7	9	
Hourly Flow Ra	•		455				189		
Percent Heavy									
Median Type/St RT Channelized	orage	Undiv	ided			/			
Lanes	•		2				2		
Configuration			T				T		
Upstream Signa	1 ?		No				No		
opseream bigna	.± •		NO				110		
Minor Street:	Approach	No	rthboun	 id			Southbo		
	Movement	7	8	9		10	11	12	
		L	T	R		L	Т	R	
Volume						3		350	
Peak Hour Fact	or, PHF					0.84	1	0.84	
Hourly Flow Ra	te, HFR					3		416	
Percent Heavy	Vehicles					0		2	
Percent Grade			0				0		
Flared Approac	h: Exists?	/Storage			/				/
Lanes		_				1	L	1	
Configuration							L	R	
		Queue Le	-			f Sei			
Approach	EB	WB	_	thboun	-			uthbound	
Movement	1	4	7	8	9		10	11	12
Lane Config						- 1	L		R
v (vph)							3		416
C(m) (vph)							570		962
v/c							0.01		0.43
95% queue leng	th						0.02		2.21
Control Delay							11.3		11.6
LOS							В		В
Approach Delay	•							11.6	
Approach LOS								В	

Phone: E-Mail:

_____TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____

Fax:

Analyst: Jonathan Walczak

Agency/Co.: Agency/Co.: Barton & Loguidice, P.C. Date Performed: 12/17/2013

Analysis Time Period: PM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: Existing Project ID: Mill Seat Landfill East/West Street: Route 33A
North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

	Vehicle	Volumes	and	Adjustment	S		
Major Street Movements	1	2	3	4	5	6	
	L	Т	R	L	Т	R	
Volume		383			150		
Peak-Hour Factor, PHF		0.84			0.79		
Peak-15 Minute Volume		114			47		
Hourly Flow Rate, HFR		455			189		
Percent Heavy Vehicles							
Median Type/Storage RT Channelized?	Und	ivided		/			
Lanes		2			2		
Configuration		T			T		
Upstream Signal?		No			No		
opscream signar:		NO			NO		
Minor Street Movements	7	8	9	10	11	12	
	L	Т	R	L	Т	R	
Volume				3		350	
Peak Hour Factor, PHF				0.84		0.84	
Peak-15 Minute Volume				1		104	
Hourly Flow Rate, HFR				3		416	
Percent Heavy Vehicles				0		2	
Percent Grade (%)		0			0		
Flared Approach: Exist	s?/Stora	ae		/			/
RT Channelized?	,	J -		•		No	•
Lanes				1		1	
Configuration				L	R		

	Pedestrian	Volumes	and Ad	justments	
Movements	13	14	15	16	
Flow (ped/hr)	0	0	0	0	

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time to Signal Flow Flow Type Length Speed feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared in volume, major th vehicles: Shared in volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	L Gap Cal	culatio	on .						
Movement	-	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(c,base	 e)						7.5		6.2
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent t(3,1t)	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage		0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage						6.8		6.2
Follow-U	Jp Time C	alculat	ions						
Movement	_ 	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(f,base t(f,HV) P(HV) t(f))	1.00	1.00	1.00	1.00	1.00	3.50 1.00 0 3.5	1.00	3.30 1.00 2 3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

V prog

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                               Τ
                                                      R
                                                             L
                                                                            R
                                                             416
                                                                            94
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                       11
```

Total Saturation Flow Rate, s (vph)

V(c,x)	2000	
S D (11)	3000	
P(x) V(c,u,x)		
v (C, u, x)		
C(r,x)		
C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ns	
Step 1: RT from Minor St.	9	12
Conflicting Flows		94
Potential Capacity		962
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		962
Probability of Queue free St.	1.00	0.57
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1 00	1 00
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity Probability of Queue free St.	1.00	1.00
riobability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		416
Potential Capacity	4 00	570
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.57	1.00
Movement Capacity	0.57	570
Worksheet 7-Computation of the Effect of Tv	vo-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		

Stage1 Stage2 Stage1 Stage2 Stage1 Stage2 Stage1 Stage2

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity					
Part 3 - Single Stage Conflicting Flows Potential Capacity		1 00		1 00	
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity		1.00		1.00	
Result for 2 stage process: a y					
C t Probability of Queue free St.		1.00		1.00	
Step 4: LT from Minor St.		7		10	
Part 1 - First Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity					
Part 3 - Single Stage Conflicting Flows Potential Capacity				416 570	
Pedestrian Impedance Factor Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor. Cap. Adj. factor due to Impeding mvmnt		1.00 1.00 1.00 0.57		1.00	
Movement Capacity				570	
Results for Two-stage process:					
Y C t				570	
Worksheet 8-Shared Lane Calculations					
	7 8 L T	_	10 L	11 T	12 R
Volume (vph) Movement Capacity (vph) Shared Lane Capacity (vph)			3 570		416 962

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	Т	R	L	Т	R
C sep Volume Delay Q sep Q sep +1				570 3		962 416
round (Qsep +1)						
n max C sh SUM C sep n C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config						L		R
 v (vph)						3		416
C(m) (vph)						570		962
v/c						0.01		0.43
95% queue length						0.02		2.21
Control Delay						11.3		11.6
LOS						В		В
Approach Delay							11.6	
Approach LOS							В	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / 490 EB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: Existing
Project ID: Mill Seat Landfill
East/West Street: Route 33A

North/South Street: 490 EB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

incersection of i	circacion	· 11/1/		D	cuay	PCI	100 (111)	, · · ·	25
	Ve	hicle Vo	lumes ar	nd Adju	stmen	ıts			
Major Street: A	pproach		astbound			_	Westbour	 nd	
	ovement	1	2	3		4	5	6	
		L	Т	R	i	L	T	R	
 Volume			123				106		
Peak-Hour Factor	, PHF		0.89				0.87	7	
Hourly Flow Rate			138				121		
Percent Heavy Ve									
Median Type/Stor RT Channelized?		Undi	vided		/	,			
Lanes			2				2		
Configuration			T				T		
Upstream Signal?			No				No		
	pproach	N	orthbour				Southbou		
M	ovement	7	8	9		10	11	12	
		L	Т	R		L	T	R	
 Volume		22		8					
Peak Hour Factor	, PHF	0.75		0.75					
Hourly Flow Rate	, HFR	29		10					
Percent Heavy Ve		0		4					
Percent Grade (%			0				0		
Flared Approach:		?/Storag	e -	No	/		-		/
Lanes		0	C	0	,				,
		O	T D	U					
Configuration 			LR 						
	Delav.	Queue L	enath. a	and Levi	el of	Se	rvice		
Approach	EB	WB		thboun				thboun	
Movement	1	4 1	7	8	9	ı	10	11	12
	_	- I	,	LR)		10	т т	12
Lane Config				ПK		ı			
v (vph)				39					
C(m) (vph)				823					
v/c				0.05					
				0 1 E					
95% queue length				0.15					
95% queue length Control Delay LOS				9.6					
Control Delay LOS				9.6 A					
Control Delay				9.6					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: AM Route 33A / 490 EB Off-Ramp Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: Existing Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 EB Off-Ramp Study period (hrs): 0.25 Intersection Orientation: EW Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Τ R Volume 123 106 Peak-Hour Factor, PHF 0.89 0.87 Peak-15 Minute Volume 35 30 Hourly Flow Rate, HFR 138 121 Percent Heavy Vehicles Median Type/Storage Undivided RT Channelized? Lanes 2 2 Configuration Τ Τ Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 8 Volume 22 Peak Hour Factor, PHF 0.75 0.75 Peak-15 Minute Volume 7 3 Hourly Flow Rate, HFR 29 10 Percent Heavy Vehicles Percent Grade (%) 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

Lane Width (ft) 12.0 12.0 12.0 12.0 Walking Speed (ft/sec) 4.0 4.0 4.0 4.0 Percent Blockage 0 0 0 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time to Signal Flow Flow Type Length Speed feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared ln volume, major th vehicles: Shared ln volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	Gap Cal	culati	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	Т	R
t(c,base	e)			7.5		6.2			
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent t(3,1t)	Grade			0.00 0.70	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage 2-stage		0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c)	1-stage 2-stage			6.8		6.3			
Follow-U	Jp Time C	alcula	tions						
Movement	-	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	T	R
t(f,base	;)			3.50		3.30			
t(f,HV) P(HV) t(f)		1.00	1.00	1.00 0 3.5	1.00	1.00 4 3.3	1.00	1.00	1.00

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                             L
                                                                             R
                                       198
                                                      69
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

S		
9	12	
69		
987		
1.00	1.00	
987		
0.99	1.00	
4	1	
1.00	1.00	
1.00	1.00	
8	11	
1.00	1.00	
1.00	1.00	
1.00	1.00	
7	10	
<u></u>		
778		
	1.00	
	1.00	
1.00		
778	3.33	
n-stage Gan	Acceptance	
8	11	
O		
	69 987 1.00 987 0.99 4 1.00 1.00 1.00 7 1.98 778 1.00 1.00 778	9 12 69 987 1.00 1.00 987 0.99 1.00 4 1 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

Probability of Queue free St.

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

Worksheet 8-Shared Lane Calculation	ons				
y C t		7	78		
Results for Two-stage process:					
Movement Capacity			78 	 	
Cap. Adj. factor due to Impeding	mvmnt		.00	0.99	
Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor.				1.00	
Pedestrian Impedance Factor			.00	1.00	
Conflicting Flows Potential Capacity			98 78		
Part 3 - Single Stage				 	
Cap. Adj. factor due to Impeding a Movement Capacity	mvmn t				
Pedestrian Impedance Factor	m				
Potential Capacity					
Part 2 - Second Stage Conflicting Flows					
Movement Capacity				 	
Cap. Adj. factor due to Impeding	mvmnt				
Potential Capacity Pedestrian Impedance Factor					
Conflicting Flows					
Part 1 - First Stage				 	
Step 4: LT from Minor St.			7	 10	
Probability of Queue free St.		1	.00	1.00	
y C t					
a					
Result for 2 stage process:				 	
Movement Capacity	111 V 11111 C	Т	• 0 0	1.00	
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding	mvmn+		.00	1.00	
Potential Capacity					
Part 3 - Single Stage Conflicting Flows					
Movement Capacity					
Cap. Adj. factor due to Impeding	mvmnt				
Pedestrian Impedance Factor					

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	Т	R	L	Т	R
C sep Volume Delay Q sep Q sep +1 round (Qsep +1)	778 29		987 10			
n max C sh SUM C sep n C act		823				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config				LR				
v (vph)				39				
C(m) (vph)				823				
v/c				0.05				
95% queue length				0.15				
Control Delay				9.6				
LOS				А				
Approach Delay				9.6				
Approach LOS				A				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: PM

Intersection: Route 33A / 490 EB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: Existing
Project ID: Mill Seat Landfill
East/West Street: Route 33A

North/South Street: 490 EB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

				and Adju	stme	nts_			
Major Street: A	pproach	E	astbou	nd			Westbour	ıd	
M	ovement	1	2	3		4	5	6	
		L	T	R		L	T	R	
Volume			104				124		
Peak-Hour Factor	, PHF		0.8	8			0.76)	
Hourly Flow Rate	, HFR		118				163		
Percent Heavy Ve	hicles								
Median Type/Stor RT Channelized?	age	Undi	vided			/			
Lanes			2				2		
Configuration			Т				Т		
Upstream Signal?			No				No		
Minor Street: A	pproach	N	orthbo	und			Southbou	 ınd	
M	ovement	7	8	9		10	11	12	
		L	Т	R		L	T	R	
Volume		38		10					
Peak Hour Factor	, PHF	0.60		0.60					
Hourly Flow Rate	, HFR	63		16					
Percent Heavy Ve	hicles	0		0					
Percent Grade (%)		0				0		
Flared Approach:	Exists	?/Storage	е	No	/				/
Lanes		0		0					
Configuration			LR						
	Delav	Queue L	enath	and Lev		 f 94			
 Approach	Bciay, EB	WB	_	orthboun				thboun	
Movement	1	4 1	7	8	9		10	11	12
Lane Config	_	1	,	LR	,		10		12
dane config		ı		шк					
v (vph)				79					
C(m) (vph)				815					
				0.10					
v/c				0.32					
v/c 95% queue length				0.0_					
95% queue length				9.9					
95% queue length Control Delay				9.9					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: PM Route 33A / 490 EB Off-Ramp Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: Existing Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 EB Off-Ramp Study period (hrs): 0.25 Intersection Orientation: EW Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R Volume 104 124 Peak-Hour Factor, PHF 0.88 0.76 Peak-15 Minute Volume 30 41 Hourly Flow Rate, HFR 118 163 Percent Heavy Vehicles Median Type/Storage Undivided RT Channelized? Lanes 2 2 Configuration Τ Τ Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R Volume 38 10 Peak Hour Factor, PHF 0.60 0.60 Peak-15 Minute Volume 16 Hourly Flow Rate, HFR 63 16 Percent Heavy Vehicles Percent Grade (%) 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments_____ Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time Length Speed to Signal Flow Flow Type feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared ln volume, major th vehicles: Shared ln volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critica.	l Gap Cal	culati							
Movement	t	1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	Т	R
t(c,base	e)			7.5		6.2			
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv)				0		0			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,1t)				0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage			6.8		6.2			
	2-stage								
Follow-U	Up Time C	alcula	tions						
Movement	t	1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	T	R
t(f,base	e)			3.50		3.30			
t(f,HV)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)				0		0			
t(f)				3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

V prog

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                             L
                                                                             R
                                       199
                                                      59
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

V(c,x) s P(x)		
V(c,u,x)		
C(r,x) C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ns	
Step 1: RT from Minor St.	9	12
Conflicting Flows	59	
Potential Capacity	1012	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1012	
Probability of Queue free St.	0.98	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows	 199	
Potential Capacity	777	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mymnt	1.00	0.98
Movement Capacity	777	0.30
Worksheet 7-Computation of the Effect of T	wo-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
One Tall Control of the Translation		

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

Cap. Adj. factor due to Impeding mvmnt Movement Capacity Probability of Queue free St.

Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding Movement Capacity	mvmnt					
Part 3 - Single Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding Movement Capacity	mvmnt		00		1.00	
Result for 2 stage process:						
Y C t Probability of Queue free St.		1	.00		1.00	
Step 4: LT from Minor St.			7		10	
Part 1 - First Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding Movement Capacity	mvmnt					
Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding Movement Capacity	mvmnt					
Part 3 - Single Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor. Cap. Adj. factor due to Impeding Movement Capacity	mvmnt	7 1 1	.99 .77 00		1.00 1.00 1.00 0.98	
Results for Two-stage process:						
a Y						
C t			' 7 7 			
Worksheet 8-Shared Lane Calculat	ions					
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph) Movement Capacity (vph) Shared Lane Capacity (vph)	63 777	815	16 1012			

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	Т	R	L	Т	R
C sep Volume Delay Q sep Q sep +1 round (Qsep +1)	777 63		1012 16			
n max C sh SUM C sep n C act		815				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	<u>1</u>	4	7	8	9	10	11	12	
Lane Config				LR					
v (vph)				79					
C(m) (vph)				815					
v/c				0.10					
95% queue length				0.32					
Control Delay				9.9					
LOS				А					
Approach Delay				9.9					
Approach LOS				A					

Worksheet 11-Shared Major LT Impedance and Delay

	110 v Cincii e Z	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / Brew Road

Jurisdiction:

Units: U. S. Customary

Analysis Year: Existing
Project ID: Mill Seat Landfill
East/West Street: Route 33A
North/South Street: Brew Road

Intersection Orientation: EW Study period (hrs): 0.25

	Vehi	icle Volu	mes and	Adjus	tme	nts			
Major Street:	Approach		tbound	3			tbound		
-	Movement	1	2	3		4	5	6	
		L	T	R	İ	L	Т	R	
Volume			112	19		6	92		
Peak-Hour Facto			0.93	0.93		0.90	0.90		
Hourly Flow Rat			120	20		6	102		
Percent Heavy V						100			
Median Type/Sto		Undivi	ded			/			
RT Channelized?	?								
Lanes			2 0			0	1		
Configuration			T TR			LT	1		
Upstream Signal	L?		No				No		
Minor Street:	Approach		thbound				ıthboun		
	Movement	7	8	9		10	11	12	
		L	Т	R	- 1	L	Т	R	
Volume		14			.———				
Peak Hour Facto	or PHF	0.57		0.57					
Hourly Flow Rat	•	24		3					
Percent Heavy \		93		100					
Percent Grade))	0	100			0		
Flared Approach		/g+0r2g0	O	No	/		U		/
Lanes	I. EXISCS:/	0	0		/				/
Configuration		U	LR						
Configuration			ПГ						
7 mm m o o o lo	Delay, (EB	Queue Len WB		d Leve hbound		i Servı		hbound	
Approach	ЕБ 1			8	9	ı 1	.0		
Movement	Τ	4		-	9	1	. U	11	12
Lane Config		LT		LR		I			
v (vph)		6		27					
C(m) (vph)		944		538					
v/c		0.01		0.05					
95% queue lengt	ch .	0.02		0.16					
Control Delay		8.8		12.0					
LOS		A		В					
Approach Delay				12.0					
Approach LOS				В					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: AM Route 33A / Brew Road Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: Existing Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R Volume 112 19 92 6 Peak-Hour Factor, PHF 0.93 0.93 0.90 0.90 5 2 Peak-15 Minute Volume 30 26 Hourly Flow Rate, HFR 20 120 6 102 Percent Heavy Vehicles 100 Median Type/Storage Undivided RT Channelized? Lanes 2 0 0 1 Configuration Τ TR LT Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 2 Volume 14 Peak Hour Factor, PHF 0.57 0.57 Peak-15 Minute Volume 6 1 Hourly Flow Rate, HFR 24 3 Percent Heavy Vehicles 93 100 Percent Grade (%) 0 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

Lane Width (ft) 12.0 12.0 12.0 12.0 Walking Speed (ft/sec) 4.0 4.0 4.0 4.0 Percent Blockage 0 0 0 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Flow Type Time Speed to Signal Flow Length feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared In volume, major th vehicles:		102
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Gap Calo	culatio	on						
	1	4	7	8	9	10	11	12
	L	L	L	Т	R	L	Т	R
		4.1	7.5		6.2			
	2.00	2.00	2.00 93	2.00	2.00	2.00	2.00	2.00
			0.20	0.20	0.10	0.20	0.20	0.10
Grade		0 00	0.00	0.00	0.00	0.00	0.00	0.00
1-8+360	0 00			0 00		0 00	0 00	0.00
_		0.00	1.00	1.00	0.00	1.00	1.00	0.00
1-stage 2-stage		6.1	8.7		8.2			
Time Ca	alcula	tions						
	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	Т	R
	1 00	2.20	3.50	1 00	3.30	1 00	1 00	1.00
	1.00	100	93	1.00	100	1.00	1.00	1.00
	Grade 1-stage 2-stage 1-stage 2-stage Time Ca	1 L 2.00 Grade 1-stage 0.00 2-stage 0.00 1-stage 2-stage Time Calculation 1 L	L L 2.00 2.00 100 Grade 0.00 1-stage 0.00 0.00 2-stage 0.00 0.00 1-stage 6.1 2-stage Time Calculations 1 4 L L 2.20 1.00 1.00	1 4 7 L L 4.1 7.5 2.00 2.00 2.00 100 93 0.20 0.00 0.70 1-stage 0.00 0.00 0.00 2-stage 0.00 0.00 1.00 1-stage 6.1 8.7 2-stage Time Calculations 1 4 7 L L 2.20 3.50 1.00 1.00 1.00	1 4 7 8 L L L T 4.1 7.5 2.00 2.00 2.00 2.00 2.00 100 93 0.20 0.20 0.00 0.70 1-stage 0.00 0.00 0.00 2-stage 0.00 0.00 1.00 1.00 1-stage 6.1 8.7 2-stage Time Calculations 1 4 7 8 L L T 2.20 3.50 1.00 1.00 1.00	1 4 7 8 9 L L L T R 4.1 7.5 6.2 2.00 2.00 2.00 2.00 2.00 2.00 100 93 100 0.20 0.20 0.10 0.00 0.00 0.00 0.00 1-stage 0.00 0.00 0.00 0.00 2-stage 0.00 0.00 1.00 1.00 0.00 1-stage 6.1 8.7 8.2 2-stage Time Calculations 1 4 7 8 9 L L L T R 2.20 3.50 3.30 1.00 1.00 1.00 1.00	1 4 7 8 9 10 L L L T R L 4.1 7.5 6.2 2.00 2.00 2.00 2.00 2.00 2.00 2.00 100 93 100 0.20 0.20 0.10 0.20 0.00 0.00 0.00 0.00 1-stage 0.00 0.00 0.00 0.00 0.00 2-stage 0.00 0.00 1.00 1.00 0.00 1-stage 6.1 8.7 8.2 2-stage Time Calculations 1 4 7 8 9 10 L L T R L 2.20 3.50 3.30 1.00 1.00 1.00 1.00 1.00	1 4 7 8 9 10 11 L L L T R L T 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.0

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5
V(t) V(l,prot) V(t) V(l,prot)

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                             (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                     11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                              L
                                                                             R
                               140
                                       244
                                                      70
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

	-	-
V(C, X)		
s 1500		
P(x)		
V(c,u,x)		
C(r,x)		
C(plat,x)		
C(plac, x)		
Worksheet 6-Impedance and Capacity Equation	S	
Step 1: RT from Minor St.		
200p 1. 1.1 110m 111m21 20.		
Conflicting Flows	70	
Potential Capacity	7 4 4	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	7 4 4	
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows	140	
Potential Capacity	944	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	944	1.00
Probability of Queue free St.	0.99	1.00
Maj L-Shared Prob Q free St.	0.99	1.00
maj L-Shared From Q free St.	0.99	
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.		10
step 4: Li irom minor st.	/	10
Conflicting Flows	244	
Potential Capacity	523	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	520	
	·	
Worksheet 7-Computation of the Effect of Tw	o-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

Cap. Adj. factor due to Impeding mvmnt Movement Capacity Probability of Queue free St.

Part 2 - Second Stage Conflicting Flows Potential Capacity						
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding movement Capacity	mvmnt					
Part 3 - Single Stage Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			.00		1.00	
Cap. Adj. factor due to Impeding movement Capacity	III V III I C	U	.99		0.99	
Result for 2 stage process:						
y C t						
Probability of Queue free St.		1	.00		1.00	
Step 4: LT from Minor St.			7		10	
Part 1 - First Stage						
Conflicting Flows Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding n	mvmnt					
Movement Capacity						
Part 2 - Second Stage Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding :	mvmnt					
Movement Capacity						
Part 3 - Single Stage Conflicting Flows		2	44			
Potential Capacity			23			
Pedestrian Impedance Factor			.00		1.00	
Maj. L, Min T Impedance factor					0.99	
Maj. L, Min T Adj. Imp Factor.					0.99	
Cap. Adj. factor due to Impeding i	mvmnt		.99		0.99	
Movement Capacity		5	20			
Results for Two-stage process:						
У						
C t		5	20			
Worksheet 8-Shared Lane Calculation	ons					
Movement		8	9	10	11	12
	L	Т	R	L	Т	R
Volume (vph)	24		3			
Movement Capacity (vph)	520		744			
Shared Lane Capacity (vph)		538				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Moveme	ent	7	8	9	10	11	12	
		L	Т	R	L	Т	R	
C sep Volume Delay Q sep Q sep round		520 24		744				
n max C sh SUM C n C act	sep		538					

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		6		27				
C(m) (vph)		944		538				
v/c		0.01		0.05				
95% queue length		0.02		0.16				
Control Delay		8.8		12.0				
LOS		A		В				
Approach Delay				12.0				
Approach LOS				В				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		102
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		8.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period:

Intersection: Route 33A / Brew Road

Jurisdiction:

Units: U. S. Customary

Analysis Year: Existing
Project ID: Mill Seat Landfill
East/West Street: Route 33A
North/South Street: Brew Road

Intersection Orientation: EW Study period (hrs): 0.25

Major Street:	Approach	nicle Vol Ea	stbound		, cinc		 stbound		
major bereet.	Movement	1	2	3	1	4	5 c.b.o.u.i.c	6	
	Movement	L	T	R		L	T	R	
 Volume			 111	<u>_</u>			105		
Peak-Hour Fact	or. PHF		0.91	0.91		0.85	0.85		
Hourly Flow Ra			121	3		1	123		
Percent Heavy						0			
Median Type/St		Undiv	ided			/			
RT Channelized	_	0110121				,			
Lanes	•		2	0		0	1		
Configuration				'R		L			
Jpstream Signa	1 ?		No	10			No		
opocicum bigna	± •		110				110		
Minor Street:	Approach	No	rthboun			So	uthbour	nd	
	Movement	7	8	9		10	11	12	
		L	Т	R	- 1	L	Т	R	
		 17		3					
Peak Hour Fact	or, PHF	0.41		0.41					
Hourly Flow Ra		41		7					
Percent Heavy '		24		0					
Percent Grade			0	•			0		
Flared Approac	• •	?/Storage	•	No	/				/
Lanes		0		0	,				,
Configuration		O	LR	O					
	Delay,	Queue Le	ngth, a	nd Leve	el o	f Serv	ice		
Approach	EB	WB		thbound				hboun	 d
Movement	1	4	7	8	9		10	11	12
Lane Config		LT		LR					
v (vph)		1		48					
C(m) (vph)		1475		697					
v/c (vpii)		0.00		0.07					
776 95% queue leng	+ h	0.00		0.07					
Control Delay	C11	7.4		10.5					
_									
LOS		А		В 10.5					
7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 -									
Approach Delay Approach LOS				в					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: Intersection: Route 33A / Brew Road Jurisdiction: Units: U. S. Customary Analysis Year: Existing Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R 111 3 105 Volume 1 Peak-Hour Factor, PHF 0.91 0.91 0.85 0.85 Peak-15 Minute Volume 30 1 0 31 Hourly Flow Rate, HFR 1 123 121 3 Percent Heavy Vehicles 0 Median Type/Storage Undivided RT Channelized? Lanes 2 0 0 1 Configuration Τ TR LT Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 3 Volume 17 Peak Hour Factor, PHF 0.41 0.41 Peak-15 Minute Volume 10 Hourly Flow Rate, HFR 41 7 Percent Heavy Vehicles Percent Grade (%) 0 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments_____ Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

Lane Width (ft) 12.0 12.0 12.0 12.0 Walking Speed (ft/sec) 4.0 4.0 4.0 4.0 Percent Blockage 0 0 0 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Flow Type Time Speed to Signal Flow Length feet vph vph sec sec mph

S2 Left-Turn

Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared In volume, major th vehicles:		123
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Movement	. Gap Calo	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	T	R
t(c,base	;)		4.1	7.5		6.2			
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv) t(c,g)			0	24 0.20	0.20	0 0.10	0.20	0.20	0.10
Percent	Grade			0.00	0.00	0.00	0.00	0.00	0.10
t(3,1t)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage		4.1	7.3		6.2			
Follow-U	Jp Time Ca	alculat	ions						
Movement		1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	Т	R
t(f,base	e)		2.20	3.50		3.30			
t(f,HV)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)			0	24		0			
t(f)			2.2	3.7		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal
Movement 2

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                             (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                     11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                              L
                                                                             R
                               124
                                       247
                                                      62
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

	3	5
V(c,x)		
s 1500 P(x)		
V(c,u,x)		
v (C, u, x)		
C(r,x)		
C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ns 	
Step 1: RT from Minor St.	9	12
Conflicting Flows	62	
Potential Capacity	1009	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1009	
Probability of Queue free St.	0.99	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows	124	
Potential Capacity	1475	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1475	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows	247	
Potential Capacity	662	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	662	
Workshoot 7 Computation of the Effect of The		
Worksheet 7-Computation of the Effect of Tr		
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Oueue free St		

Probability of Queue free St.

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding n	nvmnt					
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor		1	.00		1.00	
Cap. Adj. factor due to Impeding n	nvmnt	1	.00		1.00	
Movement Capacity						
Result for 2 stage process:						
a						
У						
C t						
Probability of Queue free St.		1	.00		1.00	
Step 4: LT from Minor St.					10	
			<i>.</i>			
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding n	nvmnt					
Movement Capacity						
Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding m	nvmnt					
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows		2	47			
Potential Capacity			62			
Pedestrian Impedance Factor			.00		1.00	
Maj. L, Min T Impedance factor		_	• 0 0		1.00	
Maj. L, Min T Adj. Imp Factor.					1.00	
	nm.n.+	1	.00		0.99	
Cap. Adj. factor due to Impeding m	II V III I L		62		0.99	
Movement Capacity		О	62			
Results for Two-stage process:						
a						
У						
C t		6	62			
Worksheet 8-Shared Lane Calculation						
Movement	7 L	8 T	9 R	10 L	11 T	12 R
		<u>.</u>			<u>+</u> 	
						
	41					
Volume (vph) Movement Capacity (vph) Shared Lane Capacity (vph)	41 662	697	1009			

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	Т	R	L	Т	R
C sep Volume Delay Q sep Q sep +1 round (Qsep +1)	662 41		1009			
n max C sh SUM C sep n C act		697				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		1		48				
C(m) (vph)		1475		697				
v/c		0.00		0.07				
95% queue length		0.00		0.22				
Control Delay		7.4		10.5				
LOS		А		В				
Approach Delay				10.5				
Approach LOS				В				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		123
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.4
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

APPENDIX F

Capacity Analysis – Background Conditions

11.14 1242.022.013

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A

North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

		hicle V			Adjus	tme:	nts_					
	proach		Eastb					Wes	stbou	ınd		
Mc	ovement	1	2		3		4		5		6	
		L	Т		R		L		Т		R	
 Volume			4	 61					100)		
Peak-Hour Factor,	PHF		0	.94					0.7	7 5		
Hourly Flow Rate,	HFR		4	90					133	}		
Percent Heavy Veh				_								
Median Type/Stora RT Channelized?		Unc	divide	d			/					
Lanes			2						2			
Configuration			Z T						Z T			
Upstream Signal?			N	\sim					No			
opscream signar:			IN	5					NO			
Minor Street: Ap	proach		North					Sou	thbc	und		
Mc	ovement	7	8		9		10		11		12	
		L	Т		R		L		Т		R	
 Volume							11				246	
Peak Hour Factor,	PHF						0.	7 8			0.78	
Hourly Flow Rate,	HFR						14				315	
Percent Heavy Veh	nicles						90				3	
Percent Grade (%)	1		0						0			
Flared Approach:	Exists	?/Stora	age			/						/
Lanes			_					1		1		
Configuration								L		R		
	Delay,	Queue	Lengt	h, and	Leve	 l o	 f Se	 ervi	 .ce			
Approach	EB	WB		North	bound				Sc	uthk	oound	
Movement	1	4	7	8		9		1	. 0	11	1	12
Lane Config			1					l I	1			R
								1	. 4			315
v (vph)												994
v (vph) C(m) (vph)								4	114			994
								C	0.03			0.32
C(m) (vph)								C				
C(m) (vph) v/c								C	0.03			0.32
C(m) (vph) v/c 95% queue length								C	0.03			0.32 1.37
C(m) (vph) v/c 95% queue length Control Delay								C	0.03	1(0.5	0.32 1.37 10.3

Phone: Fax: E-Mail:

_____TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____

Analyst: Jonathan Walczak

Agency/Co.: Agency/Co.: Barton & Loguidice, P.C. Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

	Vehicle	Volumes	and	Adjustmen	ts		
Major Street Movements	1	2	3	4	5	6	
	L	T	R	L	Т	R	
Volume		461			100		
Peak-Hour Factor, PHF		0.94			0.75		
Peak-15 Minute Volume		123			33		
Hourly Flow Rate, HFR		490			133		
Percent Heavy Vehicles							
Median Type/Storage RT Channelized?	Undi	vided		/			
Lanes		2			2		
Configuration		T			T		
Upstream Signal?		No			No		
Minor Street Movements	7	8	9	10	11	12	
	L	Т	R	L	Т	R	
Volume				11		246	
Peak Hour Factor, PHF				0.78		0.78	
Peak-15 Minute Volume				4		79	
Hourly Flow Rate, HFR				14		315	
Percent Heavy Vehicles				90		3	
Percent Grade (%)		0			0		
Flared Approach: Exist	s?/Storac	je		/			/
RT Channelized?	_					No	
Lanes				1		1	
Configuration				L	F	3	

	Pedestrian	Volumes	and Ad	justments_
Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time to Signal Flow Flow Type Length Speed feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared in volume, major th vehicles: Shared in volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(c,base	e)						7.5		6.2
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00	2.00 90	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,1t)							0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage						8.6		6.3
	2-stage 								
Follow-U	Jp Time Ca	alculat	tions						
Movement		1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	Т	R
t(f,base	·)						3.50		3.30
t(f,HV)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)							90		3
t(f)							4.4		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                               Τ
                                                      R
                                                             L
                                                                            R
                                                             378
                                                                            66
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

V(c,x)	2000	
S D (11)	3000	
P(x) V(c,u,x)		
v (c, u, x)		
C(r,x)		
C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ns	
Step 1: RT from Minor St.	9	12
Conflicting Flows		66
Potential Capacity		994
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	4 00	994
Probability of Queue free St.	1.00	0.68
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1 00	1 00
Probability of Queue free St. Maj L-Shared Prob Q free St.	1.00	1.00
naj i snarea 1105 g 11ce se.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity Probability of Queue free St.	1.00	1.00
riobability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		378
Potential Capacity		414
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00 0.68	1.00
Cap. Adj. factor due to Impeding mvmnt Movement Capacity	0.00	414
Worksheet 7-Computation of the Effect of Tv	vo-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		

Stage1 Stage2 Stage1 Stage2 Stage1 Stage2 Stage1 Stage2

Part 1 - First Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

1.00 1.00 1.00 0.68	10 L	378 414 1.00 1.00 414 414	12 R
1.00		414 1.00 1.00 414	
1.00		414 1.00 1.00 414	
1.00		414 1.00 1.00 414	
1.00		414 1.00	
1.00		414 1.00	
1.00		414 1.00	
1.00		414	
1.00		414	
1.00		414	
7		10	
1.00		1.00	
1 00		1 00	
1.00		1.00	
1.00		1.00	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	Т	R
C sep Volume				414		994
Delay Q sep						
Q sep +1 round (Qsep +1)						
n max C sh SUM C sep n C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config						L		R
v (vph)						14		315
C(m) (vph)						414		994
v/c						0.03		0.32
95% queue length						0.10		1.37
Control Delay						14.0		10.3
LOS						В		В
Approach Delay							10.5	
Approach LOS							В	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: PM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A

North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

Movement	Madan Chroat		icle Vol		l Adjus	tme	nts_	Woo+box		
L T R L T R L T R R R R	Major Street:	Approach			2		1			
Volume		Movement		-			_			
Peak Hour Factor, PHF 0.84 0.79			Ъ	Т	K	- 1	Ъ	Т	K	
Hourly Flow Rate, HFR	 Volume			413				16:	 1	
Percent Heavy Vehicles	Peak-Hour Fact	or, PHF		0.84				0.	79	
Percent Heavy Vehicles	Hourly Flow Ra	te, HFR		491				203	3	
### Median Type/Storage										
RT Channelized? Lanes			Undiv	ided			/			
Canes 2										
Topstream Signal? Topstream Southbound Movement	Lanes			2				2		
## Approach Northbound Southbound Movement 7										
Minor Street: Approach Northbound Southbound Movement 7 8 9 10 11 12		1?								
Movement 7 8 9 10 11 12 L T R L T R Volume Peak Hour Factor, PHF Peak Hourly Flow Rate, HFR Percent Heavy Vehicles Percent Grade (%) O O Flared Approach: Exists?/Storage Configuration Delay, Queue Length, and Level of Service Approach EB WB Northbound Movement 1 4 7 8 9 10 11 12 Cane Config (wph) C(m) (vph) C(m) (vph) Control Delay Approach Delay Delay Rough B Northound Movement 1 1 4 7 8 9 10 11 12 Control Delay Control Del	-1 >	-		=: =				2.0		
Movement 7 8 9 10 11 12 L T R L T R Volume Peak Hour Factor, PHF Peak Hourly Flow Rate, HFR Percent Heavy Vehicles Percent Grade (%) Polary, Queue Length, and Level of Service Peaproach EB WB Northbound Movement 1 4 7 8 9 10 11 12 Eane Config V(vph) V(vph) V(c Volume 1 1 1 1	Minor Street:	Approach	No:	rthbound	 l			Southbo	ound	
Volume 3 377 278 377 278 377		Movement	7	8	9		10	11	12	
Delay, Queue Length, and Level of Service Delay, Queue Length, and Level of Service Delay Dela			L	T	R		L	Т	R	
Delay, Queue Length, and Level of Service Delay, Queue Length, and Level of Service Delay Dela	 Volume								377	
Add		or, PHF						3 4		4
Percent Heavy Vehicles 0								-		_
Delay, Queue Length, and Level of Service Delay Dela							_			
Canes				Ω			Ü	Ω	_	
Delay, Queue Length, and Level of Service Approach EB WB Northbound Southbound Movement 1 4 7 8 9 10 11 12 12 12 12 12 13 13			/Storage	O		/		O		/
Delay, Queue Length, and Level of Service Approach EB WB Northbound Southbound Movement 1 4 7 8 9 10 11 12 Lane Config L R 7 (vph) 3 448 C(m) (vph) 544 952 7/c 0.01 0.47 95% queue length Control Delay 11.7 12.1 LOS Approach Delay 12.1		II. HAISCS./	bcorage			/		1	1	/
Delay, Queue Length, and Level of Service Approach EB WB Northbound Southbound Movement 1 4 7 8 9 10 11 12 Lane Config L R 7 (vph) 3 448 C(m) (vph) 544 952 7/c 0.01 0.47 95% queue length Control Delay 11.7 12.1 LOS Approach Delay 12.1										
Approach EB WB Northbound Southbound Movement 1 4 7 8 9 10 11 12 12 12 12 12 13 14 15 15 15 15 15 15 15										
Approach EB WB Northbound Southbound Movement 1 4 7 8 9 10 11 12 12 12 12 12 13 14 15 15 15 15 15 15 15		Delav. ()ilelle T.el	ngth. ar	nd Leve	1 0	f Se	ervice		
Movement 1 4 7 8 9 10 11 12 Lane Config L R 7 (vph) 3 448 C(m) (vph) 544 952 7/c 0.01 0.47 95% queue length 0.02 2.56 Control Delay 11.7 12.1 LOS B B B Approach Delay 12.1	Approach			-					outhboun	 d
Lane Config L R 7 (vph) 3 448 C(m) (vph) 544 952 7/c 0.01 0.47 95% queue length 0.02 2.56 Control Delay 11.7 12.1 LOS B B Approach Delay 12.1		1	4							
v (vph) 3 448 C(m) (vph) 544 952 v/c 0.01 0.47 95% queue length 0.02 2.56 Control Delay 11.7 12.1 LOS B B Approach Delay 12.1			i							R
C(m) (vph) 544 952 v/c 0.01 0.47 95% queue length 0.02 2.56 Control Delay 11.7 12.1 LOS B B Approach Delay 12.1			'					_		
C(m) (vph) 544 952 v/c 0.01 0.47 95% queue length 0.02 2.56 Control Delay 11.7 12.1 LOS B B Approach Delay 12.1	v (vph)							3		448
0.01 0.47 95% queue length 0.02 2.56 Control Delay 11.7 12.1 LOS B B Approach Delay 12.1										952
O.02 2.56 Control Delay 11.7 12.1 COS B B Approach Delay 12.1	7/C									
Control Delay 11.7 12.1 LOS B B Approach Delay 12.1	95% queue lena	th								
LOS B B Approach Delay 12.1										
Approach Delay 12.1	-									
								_	12.1	_
	Approach LOS								В	

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Jonathan Walczak Analyst: Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: PM Intersection: Route 33A / 490 WB Off-Ramp Jurisdiction: Units: U. S. Customary Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 WB Off-Ramp Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R Volume 413 161 Peak-Hour Factor, PHF 0.84 0.79 Peak-15 Minute Volume 123 51 Hourly Flow Rate, HFR 491 203 Percent Heavy Vehicles Median Type/Storage Undivided RT Channelized? Lanes 2 2 Configuration Τ Τ Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R Volume 3 377 Peak Hour Factor, PHF 0.84 0.84 Peak-15 Minute Volume 1 112 Hourly Flow Rate, HFR 3 448 Percent Heavy Vehicles 0 2 Percent Grade (%) 0 Flared Approach: Exists?/Storage RT Channelized? No 1 Lanes 1 Configuration L R Pedestrian Volumes and Adjustments Movements 13 14 15 16

0

0

0

0

Flow (ped/hr)

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time to Signal Flow Flow Type Length Speed feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared in volume, major th vehicles: Shared in volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	L Gap Cal	culatio	on .						
Movement	-	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(c,base	 e)						7.5		6.2
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent t(3,1t)	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage		0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage						6.8		6.2
Follow-U	Jp Time C	alculat	ions						
Movement	_ _	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(f,base t(f,HV) P(HV) t(f))	1.00	1.00	1.00	1.00	1.00	3.50 1.00 0 3.5	1.00	3.30 1.00 2 3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

V prog

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                               Τ
                                                      R
                                                             L
                                                                            R
                                                             448
                                                                            102
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                       11
```

Total Saturation Flow Rate, s (vph)

V(c,x)		
S	3000	
P(x)		
V(c,u,x)		
C(r,x) C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ns	
Step 1: RT from Minor St.	9	12
Conflicting Flows		102
Potential Capacity		952
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		952
Probability of Queue free St.	1.00	0.53
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St. Maj L-Shared Prob Q free St.	1.00	1.00
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	1 00	1 00
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		448
Potential Capacity		544
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.53	1.00
Movement Capacity		544
Worksheet 7-Computation of the Effect of Tr	wo-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		

Stage1 Stage2 Stage1 Stage2 Stage1 Stage2 Stage1 Stage2

Part 1 - First Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvm	nt					
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor		1	.00		1.00	
Cap. Adj. factor due to Impeding mvm	nt	1	.00		1.00	
Movement Capacity						
Result for 2 stage process:						
a						
y ~ .						
C t		1	0.0		1 00	
Probability of Queue free St.		1	.00		1.00	
Step 4: LT from Minor St.			7		10	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvm	nt					
Movement Capacity						
Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvm	nt					
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows					448	
Potential Capacity		-	0.0		544	
Pedestrian Impedance Factor			.00		1.00	
Maj. L, Min T Impedance factor			.00			
Maj. L, Min T Adj. Imp Factor. Cap. Adj. factor due to Impeding mvm	n+		.53		1.00	
Movement Capacity	11 C	O	• 5 5		544	
Results for Two-stage process:						
a v						
Y C t					544	
					J 1 1	
Worksheet 8-Shared Lane Calculations						
Movement	7	8	9	10	11	12
	L	Т	R	L	Т	R
Volume (vph)				3		448
Movement Capacity (vph)				544		952
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement		7	8	9	10	11	12
		L	Т	R	L	Т	R
C sep Volume Delay Q sep					544		952 448
Q sep +1 round (Qse	p +1)						
n max C sh SUM C sep n C act							

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	<u>_</u>	4	7	8	9	10	11	12
Lane Config						L		R
v (vph)						3		448
C(m) (vph)						544		952
v/c						0.01		0.47
95% queue length						0.02		2.56
Control Delay						11.7		12.1
LOS						В		В
Approach Delay							12.1	
Approach LOS							В	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj) v(il), Volume for stream 2 or 5 v(i2), Volume for stream 3 or 6 s(i1), Saturation flow rate for stream 2 or 5 s(i2), Saturation flow rate for stream 3 or 6	1.00	1.00
P*(oj) d(M,LT), Delay for stream 1 or 4 N, Number of major street through lanes d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / 490 EB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A

North/South Street: 490 EB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

					_	_			
	Ve	hicle Vol	umes	and Adjus	stme	nts_			
Major Street:	Approach	Ea	stbou	nd			Westbour	nd	
	Movement	1	2	3		4	5	6	
		L	T	R		L	Т	R	
 Volume			132				113		
Peak-Hour Fact	or, PHF		0.8	9			0.87	7	
Hourly Flow Ra	•		148				129		
Percent Heavy									
Median Type/St	orage	Undiv	ided			/			
Lanes	•		2				2		
Configuration			T				T		
Upstream Signa	12		No				No		
opscream bigna	· ± •		110				NO		
Minor Street:	Approach		rthbo				Southbou		
	Movement	7	8	9		10	11	12	
		L	T	R		L	Т	R	
Volume		24							
Peak Hour Fact	or, PHF	0.75		0.75					
Hourly Flow Ra	te, HFR	32		10					
Percent Heavy		0		30					
Percent Grade			0				0		
Flared Approac		?/Storage		No	/				/
Lanes		Ö		0					
Configuration		-	LR	-					
	Delay.	Queue Le	nath.	and Leve	0 [د	f Se	rvice		
Approach	BEB	WB	_	orthbound				thboun	
Movement	1	4 1	7	8	9	1	10	11	12
Lane Config	-	-	,	LR		i	± 0		± -
Lane coming				211		'			
v (vph)				42					
C(m) (vph)				792					
v/c				0.05					
95% queue leng	rth			0.17					
Control Delay				9.8					
LOS				A					
Approach Delay	,			9.8					
Approach LOS				A					
II									

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: AM Intersection: Route 33A / 490 EB Off-Ramp Jurisdiction: Units: U. S. Customary Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 EB Off-Ramp Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Τ R Volume 132 113 Peak-Hour Factor, PHF 0.89 0.87 Peak-15 Minute Volume 37 32 Hourly Flow Rate, HFR 129 148 Percent Heavy Vehicles Median Type/Storage Undivided RT Channelized? Lanes 2 2 Configuration Τ Τ No Upstream Signal? No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 8 Volume 24 Peak Hour Factor, PHF 0.75 0.75 Peak-15 Minute Volume 8 3 Hourly Flow Rate, HFR 32 10 Percent Heavy Vehicles Percent Grade (%) 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments_____ Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time Length Speed to Signal Flow Flow Type feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared in volume, major th vehicles: Shared in volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	. Gap Cal	culatio	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	Т	R
t(c,base	e)			7.5		6.2			
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00 30	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent t(3,1t)	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage		0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage			6.8		6.8			
Follow-U	Jp Time C	alculat	ions						
Movement	-	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(f,base t(f,HV) P(HV) t(f)	2)	1.00	1.00	3.50 1.00 0 3.5	1.00	3.30 1.00 30 3.6	1.00	1.00	1.00

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

V prog

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                             L
                                                                             R
                                       212
                                                      74
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

Probability of Queue free St.

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

9 10 R L	1.00 1.00 1.00 0.99
0	1.00
	1.00
	1.00
	1.00
	1.00
	1.00
	1.00
0	1.00
0	
 7	10
0	1.00
0	1.00
0	1.00

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

7	8	9	10	11	12	
L	Т	R	L	Т	R	
763 32		902				
	792					
	763	763 32	L T R 763 902 32 10	L T R L 763 902 32 10	T R L T 763 902 32 10	L T R L T R 763 902 32 10

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	<u>1</u>	4	7	8	9	10	11	12	
Lane Config				LR					
v (vph)				42					
C(m) (vph)				792					
v/c				0.05					
95% queue length				0.17					
Control Delay				9.8					
LOS				A					
Approach Delay				9.8					
Approach LOS				A					

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: PM

Intersection: Route 33A / 490 EB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A

North/South Street: 490 EB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

	Ve	hicle Vol	Lumes a	nd Adju	stmer	$nts_{_}$			
Major Street: A	Approach	Εá	astboun	d		_	Westbour	ıd	
1	Movement	1	2	3		4	5	6	
		L	Т	R		L	T	R	
Volume			123				133		
Peak-Hour Factor	c, PHF		0.88				0.76)	
Hourly Flow Rate	∍, HFR		139				175		
Percent Heavy Ve	ehicles								
Median Type/Sto RT Channelized?		Undi	vided		,	/			
Lanes			2				2		
Configuration			Т				Т		
Upstream Signal	?		No				No		
Minor Street: A	Approach	No	orthbou	nd			Southbou	ınd	
ľ	Movement	7	8	9		10	11	12	
		L	Т	R		L	Т	R	
Volume		41		11					
Peak Hour Factor	c, PHF	0.60		0.60					
Hourly Flow Rate	∍, HFR	68		18					
Percent Heavy Ve	ehicles	0		7					
Percent Grade (9	ਰੇ)		0				0		
Flared Approach:	: Exists	?/Storage	9	No	/				/
Lanes		0		0					
Configuration			LR						
	Delay.	Queue Le	 -nath.	and Lev	el of	 f Se	rvice		
Approach	EB	WB	_	rthboun				thboun	
Movement	1	4	7	8	9		10	11	12
Lane Config	_	- '	,	LR		ï			
name coming		1				'			
v (vph)				86					
C(m) (vph)				786					
C(III) (VPII)				0.11					
v/c	ı			0.37					
v/c 95% queue length	ı			10.1					
v/c 95% queue length Control Delay LOS	n.								
v/c 95% queue length Control Delay	n			10.1					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: PM Route 33A / 490 EB Off-Ramp Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 EB Off-Ramp Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Τ R Volume 123 133 Peak-Hour Factor, PHF 0.88 0.76 Peak-15 Minute Volume 35 44 Hourly Flow Rate, HFR 175 139 Percent Heavy Vehicles Median Type/Storage Undivided RT Channelized? Lanes 2 2 Configuration Τ Τ Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 11 Volume 41 Peak Hour Factor, PHF 0.60 0.60 Peak-15 Minute Volume 17 5 Hourly Flow Rate, HFR 18 68 Percent Heavy Vehicles Percent Grade (%) 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments_____ Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time Length Speed to Signal Flow Flow Type feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared in volume, major th vehicles: Shared in volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	Gap Cal	culati	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(c,base)			7.5		6.2			
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent t(3,1t)	Grade			0.00 0.70	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
, , ,	2-stage		0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage			6.8		6.3			
Follow-U	p Time C	alcula	ions						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(f,base)			3.50		3.30			
t(f,HV) P(HV)		1.00	1.00	1.00	1.00	1.00 7	1.00	1.00	1.00
t(f)				3.5		3.4			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                             L
                                                                             R
                                       226
                                                      70
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

zaager zaager zaager zaager		-
V(c,x)		
s 3000		
P(x)		
V(c,u,x)		
C(r,x)		
C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ıs	
Step 1: RT from Minor St.	9	12
Conflicting Flore	70	
Conflicting Flows Potential Capacity	976	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	976	1.00
Probability of Queue free St.	0.98	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.		10
beep 1. If from filled be.	,	10
Conflicting Flows	226	
Potential Capacity	748	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.98
Movement Capacity	748	
Worksheet 7-Computation of the Effect of Tv	vo-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt Movement Capacity		
Probability of Oueue free St		

Probability of Queue free St.

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

olume (vph) 68 ovement Capacity (vph) 748 nared Lane Capacity (vph)	786	18 976			
ovement 7 L	8 T	9 R	10 L	11 T	12 R
orksheet 8-Shared Lane Calculations					
t 	7	48			
esults for Two-stage process:					
ap. Adj. factor due to Impeding mvmnt ovement Capacity		.00 48		0.98	
aj. L, Min T Adj. Imp Factor.	a	0.0		1.00	
aj. L, Min T Impedance factor	1	• • •		1.00	
otential Capacity edestrian Impedance Factor		48		1.00	
onflicting Flows		26			
art 3 - Single Stage					
ovement Capacity					
edestrian Impedance Factor ap. Adj. factor due to Impeding mvmnt					
otential Capacity					
onflicting Flows					
art 2 - Second Stage					
ovement Capacity					
edestrian Impedance Factor ap. Adj. factor due to Impeding mvmnt					
otential Capacity					
onflicting Flows					
art 1 - First Stage					
tep 4: LT from Minor St.				10	
robability of Queue free St.	1	.00		1.00	
t					
esult for 2 stage process:					
ovement Capacity					
ap. Adj. factor due to Impeding mvmnt	1	.00		1.00	
otential Capacity edestrian Impedance Factor	1	.00		1.00	
onflicting Flows					
art 3 - Single Stage					
ovement Capacity					
ap. Adj. factor due to Impeding mvmnt					
acserian impedance ractor					
otential Capacity edestrian Impedance Factor					

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12	
	L	T	R	L	Т	R	
C sep	748		976				
Volume Delay Q sep Q sep +1	68		18				
round (Qsep +1)							
n max C sh SUM C sep		786					
n C act							

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config				LR				
v (vph)				86				
C(m) (vph)				786				
v/c				0.11				
95% queue length				0.37				
Control Delay				10.1				
LOS				В				
Approach Delay				10.1				
Approach LOS				В				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / Brew Road

Jurisdiction:

Units: U. S. Customary

Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road

Intersection Orientation: EW Study period (hrs): 0.25

 Major Street:	Approach	nicle Vol Ea	stbou				stbound		
	Movement	1	2	3	ı	4	5	6	
	110 V GM GIT G	L	T	R	İ	L	T	R	
 Volume			121	19		6	99		
Peak-Hour Fact	or, PHF		0.9	3 0.93		0.90	0.90		
Hourly Flow Ra	te, HFR		130	20		6	110		
Percent Heavy						100			
Median Type/St		Undiv	ided			/			
RT Channelized	_								
Lanes			2	0		0	1		
Configuration			т	TR		L			
Upstream Signa	12		No	110			No		
opscream bigna	_ •		110				110		
Minor Street:	Approach	 No	rthbo	 und		So	uthboun	<u> </u>	
	Movement	7	8	9	- 1	10	11	12	
		L	Т	R	i	L	Т	R	
					·				
Volume		14		2					
Peak Hour Fact	or, PHF	0.57		0.57					
Hourly Flow Ra		24		3					
Percent Heavy	Vehicles	93		100					
Percent Grade	(%)		0				0		
Flared Approac	h: Exists	?/Storage		No	/				/
Lanes		0		0					
Configuration			LR						
	Dol 277	Queue Le		and Tow		f Coru			
Approach	Delay , EB	WB		orthboun		r serv		hboun	
Movement	1	4 1	7	8	9	1		11	12
Lane Config	-	LT I	,	LR		i	10		
Jane Coning		шт Т		ш		1			
v (vph)		6		27					
C(m) (vph)		932		521					
v/c		0.01		0.05					
95% queue leng	th	0.02		0.16					
Control Delay		8.9		12.3					
LOS		A		В					
100		Ω		12.3					
Annroach Dolass									
Approach Delay Approach LOS				12.3 B					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: AM Route 33A / Brew Road Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R Volume 121 19 99 6 Peak-Hour Factor, PHF 0.93 0.93 0.90 0.90 5 2 Peak-15 Minute Volume 33 28 130 Hourly Flow Rate, HFR 20 6 110 Percent Heavy Vehicles 100 Median Type/Storage Undivided RT Channelized? Lanes 2 0 0 1 Configuration Τ TR LT Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 2 Volume 14 Peak Hour Factor, PHF 0.57 0.57 Peak-15 Minute Volume 6 1 Hourly Flow Rate, HFR 24 3 Percent Heavy Vehicles 93 100 Percent Grade (%) 0 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

Lane Width (ft) 12.0 12.0 12.0 12.0 Walking Speed (ft/sec) 4.0 4.0 4.0 4.0 Percent Blockage 0 0 0 0

	Up:	stream Sig	nal Dat	a	
				Length	 to Signal

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

2 Movement 5
110
0
1700
1700
1
ion
_

Critical	Gap Cal	culatio	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	Т	R
t(c,base)		4.1	7.5		6.2			
t(c,hv) P(hv)		2.00	2.00	2.00 93	2.00	2.00	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent	Grade		0 00	0.00	0.00	0.00	0.00	0.00	0.00
t(3,1t)	1	0 00	0.00	0.70	0 00	0.00	0 00	0 00	0 00
t(c,T):	1-stage		0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage		0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage		6.1	8.7		8.2			
Follow-U	p Time C	alculat	ions						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50		3.30			
t(f,HV)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)			100	93		100			
t(f)			3.2	4.4		4.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2

V(t) V(1,prot) V(t) V(1,prot)

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                             (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                     11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                              L
                                                                             R
                               150
                                       262
                                                      75
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

	2	
V(c,x)		
s 1500		
P(x)		
V(c,u,x)		
C(r,x)		
C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ns	
Step 1: RT from Minor St.	9	12
Conflicting Flows	 75	
Potential Capacity	738	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	738	1.00
Probability of Queue free St.	1.00	1.00
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows	150	
Potential Capacity	932	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	932	1.00
Probability of Queue free St.	0.99	1.00
Maj L-Shared Prob Q free St.	0.99	1.00
maj L-Shared Prob Q free St.	0.99	
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00
		1.0
Step 4: LT from Minor St.	7	10
Conflicting Flows	262	
Potential Capacity	506	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	503	0.99
novement capacity	505	
Worksheet 7-Computation of the Effect of Tv	wo-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

Cap. Adj. factor due to Impeding mvmnt Movement Capacity Probability of Queue free St.

Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding Movement Capacity	mvmnt					
Part 3 - Single Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding Movement Capacity	mvmnt		.00		1.00	
Result for 2 stage process: a Y C t Probability of Queue free St.		1	00		1.00	
Step 4: LT from Minor St.			7		10	
Part 1 - First Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding Movement Capacity	mvmnt					
Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding Movement Capacity	mvmnt					
Part 3 - Single Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor. Cap. Adj. factor due to Impeding Movement Capacity	mvmnt	5	262 506 00		1.00 0.99 0.99 0.99	
Results for Two-stage process:						
y C t			503			
Worksheet 8-Shared Lane Calculat:	ions					
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph) Movement Capacity (vph) Shared Lane Capacity (vph)	24 503	521	3 738			

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	Т	R	L	Т	R
C sep Volume Delay Q sep Q sep +1 round (Qsep +1)	503 24		738			
n max C sh SUM C sep n C act		521				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		6		27				
C(m) (vph)		932		521				
v/c		0.01		0.05				
95% queue length		0.02		0.16				
Control Delay		8.9		12.3				
LOS		А		В				
Approach Delay				12.3				
Approach LOS				В				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		110
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		8.9
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: PM

Intersection: Route 33A / Brew Road

Jurisdiction:

Units: U. S. Customary

Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road

Intersection Orientation: EW Study period (hrs): 0.25

Major Street:	Approach	nicle Vol Ea	stbour		Westbound				
_	Movement	1	2	3		4	5	6	
		L	T	R	İ	L	T	R	
 Volume			119	3		1	113		
Peak-Hour Facto	r, PHF		0.91	0.91		0.85	0.85		
Hourly Flow Rat	e, HFR		130	3		1	132		
Percent Heavy V	ehicles					100			
Median Type/Sto	rage	Undiv	ided			/			
RT Channelized?)								
Lanes			2	0		0	1		
Configuration			T	TR		L'	Γ		
Upstream Signal	.?		No				No		
Miles and Od and I	7)		1- 1						
	Approach		rthbou				uthboun		
	Movement	7	8	9		10	11	12	
		L	Т	R		L	T	R	
 Volume		18		3					
Peak Hour Facto	or, PHF	0.41		0.41					
Hourly Flow Rat	e, HFR	43		7					
Percent Heavy V		26		33					
Percent Grade (0				0		
Flared Approach	Exists	?/Storage		No	/				/
Lanes		Ō		0					
Configuration			LR						
 Approach	Delay, EB	Queue Le WB	_	and Leve orthboun		f Serv		hhoun	
Approach Movement	1	wв 4 I	7	8	ر 9	1 .	50ut 10	hbound 11	ى 12
	Τ	4 LT	/	o LR)	.	T O	T T	1 4
Lane Config		БΤ		ΤΚ		ı			
v (vph)		1		50					
C(m) (vph)		952		664					
V/C		0.00		0.08					
95% queue lengt	h	0.00		0.24					
Control Delay		8.8		10.9					
1		A		В					
LOS									
LOS Approach Delay				10.9					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: PM Route 33A / Brew Road Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: BACKGROUND Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R 119 3 113 Volume 1 Peak-Hour Factor, PHF 0.91 0.91 0.85 0.85 Peak-15 Minute Volume 33 1 0 33 Hourly Flow Rate, HFR 130 132 3 1 Percent Heavy Vehicles 100 --Median Type/Storage Undivided RT Channelized? Lanes 2 0 0 1 Configuration Т TR LT Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 3 Volume 18 Peak Hour Factor, PHF 0.41 0.41 Peak-15 Minute Volume 11 2 Hourly Flow Rate, HFR 43 7 Percent Heavy Vehicles 26 33 Percent Grade (%) 0 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments_____ Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

Lane Width (ft) 12.0 12.0 12.0 12.0 Walking Speed (ft/sec) 4.0 4.0 4.0 4.0 Percent Blockage 0 0 0 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Flow Type Time Speed to Signal Flow Length feet vph vph sec sec mph

S2 Left-Turn

Through
S5 Left-Turn
Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared In volume, major th vehicles:		132
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	Gap Cal	culatio	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	Т	R
t(c,base)		4.1	7.5		6.2			
t(c,hv) P(hv)		2.00	2.00	2.00 26	2.00	2.00 33	2.00	2.00	2.00
t(c , g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3 , lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage		6.1	7.3		6.9			
Follow-U	p Time Ca	alcula	tions						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50		3.30			
t(f , HV) P(HV)		1.00	1.00 100	1.00 26	1.00	1.00 33	1.00	1.00	1.00
t(f)			3.2	3.8		3.6			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

 $\begin{array}{cccc} & \text{Movement 2} & \text{Movement 5} \\ & \text{V(t)} & \text{V(l,prot)} & \text{V(t)} & \text{V(l,prot)} \end{array}$

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                     11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                              L
                                                                             R
                               133
                                       266
                                                      66
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

souger souger souger souger	on sought sough	32
V(c,x)		
s 1500		
P(x)		
V(c,u,x)		
C(r,x)		
C(plat,x)		
0 (P140/11)		
Worksheet 6-Impedance and Capacity Equation	ıs	
Olas 1 DE Care Mines Ol		
Step 1: RT from Minor St.	9	12
Conflicting Flows	66	
Potential Capacity	904	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	904	
Probability of Queue free St.	0.99	1.00
2		
Step 2: LT from Major St.	4	1
Conflicting Flows	133	
Potential Capacity	952	1 00
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	952	1 00
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	
Step 3: TH from Minor St.	<u>8</u>	11
Conflicting Flows		
Potential Capacity	1 00	1 00
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	1 00	1 00
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.		10
<u> </u>		<u>-</u>
Conflicting Flows	266	
Potential Capacity	638	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	637	
Worksheet 7-Computation of the Effect of Tw	o-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		

Stage1 Stage2 Stage1 Stage2 Stage1 Stage2 Stage1 Stage2

Part 1 - First Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

folume (vph) 4: Movement Capacity (vph) 6: hared Lane Capacity (vph)	3 3 7 6 6 4	7 904			
	7 8 L T	9 R	10 L	11 T	12 R
orksheet 8-Shared Lane Calculations					
t		637			
esults for Two-stage process:					
ap. Adj. factor due to Impeding mvmnt dovement Capacity		1.00 637		0.99	
aj. L, Min T Adj. Imp Factor.				1.00	
aj. L, Min T Impedance factor		1.00		1.00	
otential Capacity edestrian Impedance Factor		638 1.00		1.00	
onflicting Flows		266			
art 3 - Single Stage					
ovement Capacity					
edestrian Impedance Factor ap. Adj. factor due to Impeding mvmnt					
otential Capacity					
onflicting Flows					
art 2 - Second Stage					
ap. Adj. lactor due to impeding momint dovement Capacity					
edestrian Impedance Factor ap. Adj. factor due to Impeding mvmnt					
otential Capacity					
art 1 - First Stage onflicting Flows					
<u> </u>		<i>,</i> 			
tep 4: LT from Minor St.				10	
robability of Queue free St.		1.00		1.00	
: : t					
esale for a stage process.					
esult for 2 stage process:					
lovement Capacity				_ • • •	
edestrian Impedance Factor ap. Adj. factor due to Impeding mvmnt		1.00		1.00	
otential Capacity		1 00		1 00	
onflicting Flows					
art 3 - Single Stage					
ovement Capacity					
ap. Adj. factor due to Impeding mvmnt					
-					
otential Capacity edestrian Impedance Factor					

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	Т	R	L	Т	R
C sep	637		904			
Volume	43		7			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		664				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		1		50				
C(m) (vph)		952		664				
V/C		0.00		0.08				
95% queue length		0.00		0.24				
Control Delay		8.8		10.9				
LOS		A		В				
Approach Delay				10.9				
Approach LOS				В				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		132
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		8.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

APPENDIX G

Capacity Analysis – Projected Conditions

11.14 1242.022.013

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year:

Project ID: Mill Seat Landfill East/West Street: Route 33A

North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

	Vehi	cle Vol	umes and	d Adjus	stme	nts			
Major Street: A	pproach	Ea	stbound				Vestboun	 d	
-	ovement	1	2	3	- 1	4	5	6	
	0 / 01110110	L	T	R	i	L	Т	R	
		Д	_	11	1	ш	1	10	
Volume			466				1 O E		
							105		
Peak-Hour Factor			0.94				0.75		
Hourly Flow Rate			495				140		
Percent Heavy Ve	hicles								
Median Type/Stor	age	Undiv.	ided			/			
RT Channelized?	_								
Lanes			2				2		
Configuration			T				T		
							_		
Upstream Signal?			No				No		
M' Ol 1			. 1 1-1				N - 1 1 1 - 1		
	pproach		rthbound				Southbour		
M	ovement	7	8	9		10	11	12	
		L	T	R		L	T	R	
Volume						25		260	
Peak Hour Factor						0.78	3	0.78	}
Hourly Flow Rate	, HFR					32		333	
Percent Heavy Ve	hicles					96		3	
Percent Grade (%			0				0		
Flared Approach:		Storage			/		-		/
Lanes	LAIDED.	beorage			,	-		1	/
						_	=		
Configuration							L I	R	
	Delay, Q		-			f Sei			
Approach	EB	WB		chbound				thbound	
Movement	1	4	7	8	9		10	11	12
Lane Config							L		R
v (vph)							32		333
C(m) (vph)							398		989
v/c							0.08		0.34
95% queue length							0.26		1.50
Control Delay							14.8		10.5
LOS							В		В
							ט	100	ט
Approach Delay								10.9	
Approach LOS								В	

Phone: Fax: E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____

Analyst:
Agency/Co.:
Date Performed:

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Analysis Time Period: AM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year:

Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

	Vehicle	Volumes	and	Adjustment	ts		
Major Street Movements	1	2	3	4	5	6	
	L	Т	R	L	T	R	
Volume		466			105		
Peak-Hour Factor, PHF		0.94			0.75		
Peak-15 Minute Volume		124			35		
Hourly Flow Rate, HFR		495			140		
Percent Heavy Vehicles							
Median Type/Storage	Und	ivided		/			
RT Channelized?							
Lanes		2			2		
Configuration		T			T		
Upstream Signal?		No			No		
Minor Street Movements	7	8	9	10	11	12	
	L	Т	R	L	Т	R	
Volume				25		260	
Peak Hour Factor, PHF				0.78		0.78	
Peak-15 Minute Volume				8		83	
Hourly Flow Rate, HFR				32		333	
Percent Heavy Vehicles				96		3	
Percent Grade (%)		0			0		
Flared Approach: Exist	s?/Stora	ge		/			/
RT Channelized?	•	-				No	•
Lanes				1		1	
Configuration				L]	R	

	Pedestrian	Volumes	and Ad	justments
Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft) 12.0 12.0 12.0 12.0 Walking Speed (ft/sec) 4.0 4.0 4.0 4.0 Percent Blockage 0 0 0 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time Length Speed to Signal Flow Flow Type feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn

Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared In volume, major th vehicles: Shared In volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	Gap Cal	culatio	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	Т	R
t(c,base	:)						7.5		6.2
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00	2.00 96	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent t(3,1t)	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage		0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c)	2-stage 1-stage		0.00	1.00	1.00	0.00	1.00 8.7	1.00	0.00 6.3
	2-stage								
Follow-U	p Time C	alculat	tions						
Movement		1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	T	R
t(f,base t(f,HV)	:)	1.00	1.00	1.00	1.00	1.00	3.50	1.00	3.30
P(HV) t(f)							96 4.5		3 3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                               Τ
                                                      R
                                                             L
                                                                            R
                                                             387
                                                                            70
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                       11
```

Total Saturation Flow Rate, s (vph)

V(c,x)		
S	3000	
P(x)		
V(c,u,x)		
C(r,x)		
C(plat, x)		
Worksheet 6-Impedance and Capacity Equation	ıs	
Step 1: RT from Minor St.	9	12
Conflicting Flows		70
Potential Capacity		989
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		989
Probability of Queue free St.	1.00	0.66
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		387
Potential Capacity		398
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.66	1.00
Movement Capacity		398
Worksheet 7-Computation of the Effect of Tv	ro-stage Gap Acce	eptance
Step 3: TH from Minor St.		11
<u>-</u>	-	
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity Pedestrian Impedance Factor		

Stage1 Stage2 Stage1 Stage2 Stage1 Stage2 Stage1 Stage2

Part 1 - First Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity						
Part 3 - Single Stage Conflicting Flows Potential Capacity						
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity			00		1.00	
Result for 2 stage process: a y						
C t Probability of Queue free St.		1.	00		1.00	
Step 4: LT from Minor St.			7		10	
Part 1 - First Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity Part 2 - Second Stage Conflicting Flows Potential Capacity Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt Movement Capacity						
Part 3 - Single Stage Conflicting Flows Potential Capacity					387 398	
Pedestrian Impedance Factor Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor. Cap. Adj. factor due to Impeding mvmnt Movement Capacity		1. 1.	00 00 00 66		1.00 1.00 398	
Results for Two-stage process:						
а У						
C t					398	
Worksheet 8-Shared Lane Calculations						
	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph) Movement Capacity (vph) Shared Lane Capacity (vph)				32 398		333 989

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	Т	R
C sep Volume Delay Q sep Q sep +1 round (Qsep +1)				398 32		989 333
n max C sh SUM C sep n C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config						L		R
 v (vph)						32		333
C(m) (vph)						398		989
v/c						0.08		0.34
95% queue length						0.26		1.50
Control Delay						14.8		10.5
LOS						В		В
Approach Delay						10.9		
Approach LOS				В				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj) v(il), Volume for stream 2 or 5	1.00	1.00
$v(i2)$, Volume for stream 3 or 6 $s(i1)$, Saturation flow rate for stream 2 or 5 $s(i2)$, Saturation flow rate for stream 3 or 6 $P^*(oj)$		
<pre>d(M,LT), Delay for stream 1 or 4 N, Number of major street through lanes d(rank,1) Delay for stream 2 or 5</pre>		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: PM

Intersection: Route 33A / 490 WB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year:

Project ID: Mill Seat Landfill East/West Street: Route 33A

North/South Street: 490 WB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

	Vehi	cle Vol	umes an	d Adju	stme	nts			
Major Street:	Approach		stbound				lestbour	 nd	
3	Movement	1	2	3	1	4	5	6	
		L	Т	R	i	L	Т	R	
					·				
Volume			413				163		
Peak-Hour Fact	or, PHF		0.84				0.79)	
Hourly Flow Ra			491				206		
Percent Heavy									
Median Type/St		Undiv	ided			/			
RT Channelized		Ondiv	iaca			/			
Lanes	•		2				2		
Configuration			Z T				T		
	1.0								
Upstream Signa	.1.3		No				No		
Minor Street:	Approach	 No	 rthboun	 d			outhbou	 ınd	
	Movement	7	8	9	1	10	11	12	
		L	Т	R	i	L	Т	R	
Volume						4		378	
Peak Hour Fact	or, PHF					0.84		0.84	
Hourly Flow Ra						4		450	
Percent Heavy						58		2	
Percent Grade			0				0	_	
Flared Approac		Storage	•		/		Ŭ		/
Lanes		ccrage			,	1		1	,
Configuration							L	R	
Confrigulation							п	10	
	Delay, Q	ueue Le	 ngth, a	nd Lev	el o	f Ser	vice		
Approach	EB	WB	Nor	thboun	d		Sou	ıthbound	
Movement	1	4	7	8	9		10	11	12
Lane Config		1					L		R
-									
v (vph)							4		450
C(m) (vph)							416		951
v/c							0.01		0.47
95% queue leng	th						0.03		2.59
Control Delay							13.7		12.1
LOS							В		В
Approach Delay	,						_	12.2	_
Approach LOS								В	
PP1-04011 HOD								_	

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Jonathan Walczak Analyst: Barton & Loquidice, P.C. Agency/Co.: Date Performed: 12/17/2013 Analysis Time Period: PM Intersection: Route 33A / 490 WB Off-Ramp Jurisdiction: Units: U. S. Customary Analysis Year: Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 WB Off-Ramp Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R Volume 413 163 Peak-Hour Factor, PHF 0.84 0.79 52 Peak-15 Minute Volume 123 Hourly Flow Rate, HFR 491 206 Percent Heavy Vehicles Median Type/Storage Undivided RT Channelized? Lanes 2 2 Configuration Τ Τ No Upstream Signal? No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R Volume 378 4 Peak Hour Factor, PHF 0.84 0.84 Peak-15 Minute Volume 1 112 Hourly Flow Rate, HFR 4 450 Percent Heavy Vehicles 58 2 Percent Grade (%) 0 Flared Approach: Exists?/Storage RT Channelized? No 1 Lanes 1 Configuration L R Pedestrian Volumes and Adjustments Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time Length Speed to Signal Flow Flow Type feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared in volume, major th vehicles: Shared in volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	Gap Cal	culatio	 on						
Movement	_	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(c,base)						7.5		6.2
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv)							58		2
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,1t)							0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage						8.0		6.2
	2-stage								
Follow-U	p Time C	alculat	ions						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	T	R
t(f,base)						3.50		3.30
t(f,HV)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)							58		2
t(f)							4.1		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

V prog

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                               Τ
                                                      R
                                                             L
                                                                            R
                                                             451
                                                                            103
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                       11
```

Total Saturation Flow Rate, s (vph)

V(C, x)	2000	
S	3000	
P(x) V(c,u,x)		
v (C, u, x)		
C(r,x)		
C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ıs	
Step 1: RT from Minor St.	9	12
Conflicting Flows		103
Potential Capacity		951
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		951
Probability of Queue free St.	1.00	0.53
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	1 00	1 00
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		451
Potential Capacity		416
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	1 00
Cap. Adj. factor due to Impeding mvmnt Movement Capacity	0.53	1.00 416
Movement Capacity		410
Worksheet 7-Computation of the Effect of Tr	vo-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		

Stage1 Stage2 Stage1 Stage2 Stage1 Stage2 Stage1 Stage2

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mymnt
Movement Capacity
Probability of Queue free St.

olume (vph) Novement Capacity (vph) Chared Lane Capacity (vph)				4 1 6		450 951
lovement	7 L	8 T	9 R	10 L	11 T	12 R
Orksheet 8-Shared Lane Calculations						
t					416	
esults for Two-stage process:						
equita for Two atoms process.						
lovement Capacity					416	
aj. L, Min T Adj. imp Factor. ap. Adj. factor due to Impeding mvmn†	t		.53		1.00	
Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor.			.00			
redestrian Impedance Factor			.00		1.00	
otential Capacity					416	
eart 3 - Single Stage Conflicting Flows					451	
Novement Capacity						
edestrian Impedance Factor ap. Adj. factor due to Impeding mvmn	t					
otential Capacity						
conflicting Flows						
art 2 - Second Stage						
lovement Capacity	-					
edestrian Impedance Factor ap. Adj. factor due to Impeding mvmn	+					
otential Capacity						
art 1 - First Stage Conflicting Flows						
Part 1 - First Stage						
tep 4: LT from Minor St.			 7		10	
robability of Queue free St.		1	.00		1.00	
! t						
esult for 2 stage process:						
Novement Capacity						
ap. Adj. factor due to Impeding mvmn	t		.00		1.00	
otential Capacity redestrian Impedance Factor		1	.00		1.00	
onflicting Flows						
eart 3 - Single Stage						
lovement Capacity						
ap. Adj. factor due to Impeding mvmnt	t					
-						
otential Capacity edestrian Impedance Factor						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	Т	R
C sep Volume Delay Q sep				416		951 450
Q sep +1 round (Qsep +1)						
n max C sh SUM C sep n C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config						L		R
v (vph)						4		450
C(m) (vph)						416		951
v/c						0.01		0.47
95% queue length						0.03		2.59
Control Delay						13.7		12.1
LOS						В		В
Approach Delay						12.2		
Approach LOS							В	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / 490 EB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year:

Project ID: Mill Seat Landfill East/West Street: Route 33A

North/South Street: 490 EB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

Incorporation of i	circacton.	_ N		00	·uuy	рС	1100 (1115)	. 0.2	J
	Veh	icle Vol	umes and	Adjus	tme	nts			
Major Street: A	pproach		stbound			•	Westbound		
_	ovement	1	2	3	- 1	4	5	6	
		L	T	R	i	L	Т	R	
Volume			146				125		
Peak-Hour Factor	, PHF		0.89				0.87		
Hourly Flow Rate			164				143		
Percent Heavy Ve									
Median Type/Stor RT Channelized?		Undiv	ided			/			
Lanes			2				2		
Configuration			T				T		
Upstream Signal?			No				No		
opseream bighai.			110				110		
Minor Street: A	 pproach	 No	 rthbound				Southboun	 d	
M	ovement	7	8	9		10	11	12	
		L	T	R		L	T	R	
Volume		24		10					
Peak Hour Factor	, PHF	0.75		0.75					
Hourly Flow Rate	, HFR	32		13					
Percent Heavy Ve		0		30					
Percent Grade (%			0				0		
Flared Approach:		/Storage		No	/				/
Lanes		0	0						·
Configuration			LR						
	Delav,	 Oueue Le	ngth, an	 d Leve	 :1 o	f S	 ervice		
Approach	EB	WB	_	hbound				hbound	
Movement	1	4		8	9			11	12
Lane Config		i		LR			İ		
v (vph)				 45					
C(m) (vph)				43 777					
v/c				0.06					
				0.08					
95% queue length									
Control Delay				9.9					
LOS				A					
Approach Delay				9.9					
Approach LOS				A					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: AM Route 33A / 490 EB Off-Ramp Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 EB Off-Ramp Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Τ R Volume 146 125 Peak-Hour Factor, PHF 0.89 0.87 Peak-15 Minute Volume 41 36 Hourly Flow Rate, HFR 143 164 Percent Heavy Vehicles Median Type/Storage Undivided RT Channelized? Lanes 2 2 Configuration Τ Τ No Upstream Signal? No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R Volume 24 10 Peak Hour Factor, PHF 0.75 0.75 Peak-15 Minute Volume 8 3 Hourly Flow Rate, HFR 32 13 Percent Heavy Vehicles Percent Grade (%) 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments_____ Movements 13 14 15 16

0

0

0

0

Flow (ped/hr)

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time Length Speed to Signal Flow Flow Type feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared in volume, major th vehicles: Shared in volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	. Gap Cal	culatio	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	Т	R	L	Т	R
t(c,base	e)			7.5		6.2			
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00 30	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent t(3,1t)	Grade			0.00 0.70	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage		0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage			6.8		6.8			
Follow-U	Jp Time C	alculat	ions						
Movement	-	1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(f,base t(f,HV) P(HV) t(f)	2)	1.00	1.00	3.50 1.00 0 3.5	1.00	3.30 1.00 30 3.6	1.00	1.00	1.00

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

V prog

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                             L
                                                                             R
                                       235
                                                      82
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

zaager zaager zaager zaager		
V(c,x)		
s 3000		
P(x)		
V(c,u,x)		
C(r,x)		
C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	ıs	
Step 1: RT from Minor St.	9	12
Conflicting Flows	82	
Conflicting Flows Potential Capacity	892	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	892	1.00
Probability of Queue free St.	0.99	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.		10
300p 1. 21 220m 112mol 30.	,	10
Conflicting Flows	235	
Potential Capacity	738	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.	1 00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	738	
Worksheet 7-Computation of the Effect of Tv	vo-stage Gap Acce	ptance
Step 3: TH from Minor St.		11
		<u> </u>
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt Movement Capacity		
Probability of Oueue free St		

Probability of Queue free St.

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

П					
Novement 7	8 T	9 R	10 L	11 T	12 R
Worksheet 8-Shared Lane Calculations					
z t	7	738			
1					
Results for Two-stage process:					
Novement Capacity	7	738			
Cap. Adj. factor due to Impeding mvmnt	1	L.00		0.99	
Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor.				1.00 1.00	
Pedestrian Impedance Factor	1	L.00		1.00	
Potential Capacity	7	738			
Part 3 - Single Stage Conflicting Flows	2	235			
Cap. Adj. factor due to Impeding mvmnt Movement Capacity					
Pedestrian Impedance Factor					
Potential Capacity					
Conflicting Flows					
Part 2 - Second Stage					
Cap. Adj. factor due to Impeding mvmnt Movement Capacity					
Pedestrian Impedance Factor					
Potential Capacity					
Conflicting Flows					
Part 1 - First Stage					
Step 4: LT from Minor St.		7		10	
Probability of Queue free St.	1	L.00		1.00	
7 C t					
1					
Result for 2 stage process:					
Novement Capacity					
Cap. Adj. factor due to Impeding mvmnt		L.00		1.00	
Potential Capacity Pedestrian Impedance Factor	1	L.00		1.00	
Conflicting Flows					
Novement Capacity					
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt					
otential Capacity					
onflicting Flows					

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12	
	L	Т	R	L	Т	R	
C sep Volume	738		892 13				
Delay Q sep Q sep +1 round (Qsep +1)	32		10				
n max C sh SUM C sep n C act		777					

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config				LR				
v (vph)				45				
C(m) (vph)				777				
v/c				0.06				
95% queue length				0.18				
Control Delay				9.9				
LOS				A				
Approach Delay				9.9				
Approach LOS				А				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: PM

Intersection: Route 33A / 490 EB Off-Ramp

Jurisdiction:

Units: U. S. Customary

Analysis Year: PROJECTED Project ID: Mill Seat Landfill East/West Street: Route 33A

North/South Street: 490 EB Off-Ramp

Intersection Orientation: EW Study period (hrs): 0.25

incersection offi	IIICACIOII	· 11 VV		D	caay	PCI.	roa (III.	, · · ·	25
	Ve	hicle Vo	lumes ar	nd Adju	stmen	ts			
Major Street: Ap	proach		astbound				Westbour	 nd	
	vement	1	2	3		4	5	6	
		L	Т	R	İ	L	Т	R	
 Volume			124				136		
Peak-Hour Factor,	PHF		0.88				0.76	5	
Hourly Flow Rate,			140				178		
Percent Heavy Veh									
Median Type/Stora RT Channelized?		Undi	vided		/				
Lanes			2				2		
Configuration			T				T		
Upstream Signal?			No				No		
_	proach		orthbour				Southbou		
Mc	vement	7	8	9		10	11	12	
		L	T	R		L	Т	R	
 Volume		41		12					
Peak Hour Factor,	PHF	0.60		1.00					
Hourly Flow Rate,	HFR	68		12					
Percent Heavy Veh		0		7					
Percent Grade (%)			0				0		
Flared Approach:		?/Storage	e	No	/				/
Lanes		0		0	,				,
Configuration		O	LR	U					
			ПК						
	Delav.	Queue Le	enath. a	and Levi	el of	Sei	rvice		
 Approach	EB	WB		thboun				thboun	
Movement	1	4 1	7	8	9	1	10	11	12
	_	- I	,	LR)		10	т т	12
Lane Config		ı		ЦΚ		ı			
v (vph)				80					
C(m) (vph)				772					
				0.10					
v/c									
				0.35					
95% queue length									
v/c 95% queue length Control Delay				10.2					
95% queue length Control Delay LOS				10.2 B					
95% queue length Control Delay				10.2					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: PM Route 33A / 490 EB Off-Ramp Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: PROJECTED Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: 490 EB Off-Ramp Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R Volume 124 136 Peak-Hour Factor, PHF 0.88 0.76 Peak-15 Minute Volume 35 45 Hourly Flow Rate, HFR 178 140 Percent Heavy Vehicles Median Type/Storage Undivided RT Channelized? Lanes 2 2 Configuration Τ Τ Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 12 Volume 41 Peak Hour Factor, PHF 0.60 1.00 Peak-15 Minute Volume 17 3 Hourly Flow Rate, HFR 12 68 Percent Heavy Vehicles Percent Grade (%) 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments_____ Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Time Length Speed to Signal Flow Flow Type feet vph vph sec sec mph

S2 Left-Turn Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5

Shared in volume, major th vehicles: Shared in volume, major rt vehicles: Sat flow rate, major th vehicles: Sat flow rate, major rt vehicles: Number of major street through lanes:

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	Gap Cal	culati	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(c,base)			7.5		6.2			
t(c,hv) P(hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent t(3,1t)	Grade			0.00 0.70	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
, , ,	2-stage		0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage			6.8		6.3			
Follow-U	p Time C	alcula	ions						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	Т	R
t(f,base)			3.50		3.30			
t(f,HV) P(HV)		1.00	1.00	1.00	1.00	1.00 7	1.00	1.00	1.00
t(f)				3.5		3.4			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                            (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                    11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                             L
                                                                             R
                                       229
                                                      70
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

Stager Stagez Stager Stag	ez Stagei	Stagez Stager	Stagez
V(c,x)			
3000			
? (x)			
I(c,u,x)			
C(r,x)			
C(plat,x)			
Worksheet 6-Impedance and Capacity Equatio	ns		
Step 1: RT from Minor St.	9	12	
Conflicting Flows	70		
Potential Capacity	976		
Pedestrian Impedance Factor	1.00	1.00	
Movement Capacity	976		
Probability of Queue free St.	0.99	1.00	
Step 2: LT from Major St.	4	1	
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Movement Capacity			
Probability of Queue free St.	1.00	1.00	
Maj L-Shared Prob Q free St.			
Step 3: TH from Minor St.	8	11	
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00	
Movement Capacity			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Conflicting Flows	229		
Potential Capacity	744		
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor		1.00	
Maj. L, Min T Adj. Imp Factor.		1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99	
Novement Capacity	744		
	wo-stage Gar	Acceptance	
Step 3: TH from Minor St.	8	11	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Probability of Oueue free St.			

Probability of Queue free St.

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

Volume (vph) Movement Capacity (vph) Shared Lane Capacity (vph)	68 744	772	12 976			
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Worksheet 8-Shared Lane Calculation	ıs					
C t			7 4 4			
a Y						
Results for Two-stage process:						
Cap. Adj. factor due to Impeding my Movement Capacity	mnt		L.00 744		0.99	
Maj. L, Min T Impedance factor Maj. L, Min T Adj. Imp Factor.					1.00	
Pedestrian Impedance Factor Maj. L, Min T Impedance factor		1	L.00		1.00	
Potential Capacity			7 4 4			
Part 3 - Single Stage Conflicting Flows		2	229			
Movement Capacity						
Cap. Adj. factor due to Impeding my	mnt					
Potential Capacity Pedestrian Impedance Factor						
Conflicting Flows						
Part 2 - Second Stage						
Movement Capacity	THIT C					
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mv	7mn+					
Potential Capacity						
Part 1 - First Stage Conflicting Flows						
Step 4: LT from Minor St.			7		10	
		-				
C t Probability of Queue free St.		4	L.00		1.00	
а У						
Result for 2 stage process:						
Movement Capacity						
Cap. Adj. factor due to Impeding my	mnt	1	L.00		1.00	
Pedestrian Impedance Factor		1	L.00		1.00	
Conflicting Flows Potential Capacity						
Part 3 - Single Stage						
Movement Capacity						
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mv	mnt					
Dadaataian Immadanaa Daatan						
Potential Capacity						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	Т	R	L	Т	R
C sep Volume Delay Q sep Q sep +1 round (Qsep +1)	744 68		976 12			
n max C sh SUM C sep n C act		772				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config				LR				
v (vph)				80				
C(m) (vph)				772				
v/c				0.10				
95% queue length				0.35				
Control Delay				10.2				
LOS				В				
Approach Delay				10.2				
Approach LOS				В				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: AM

Intersection: Route 33A / Brew Road

Jurisdiction:

Units: U. S. Customary

Analysis Year: PROJECTED Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road

Intersection Orientation: EW Study period (hrs): 0.25

Major Street:	Approach	nicle Vol Ea	stbou		Westbound				
-	Movement	1	2	3		4	5	6	
		L	Т	R		L	T	R	
Volume			121			6	99		
Peak-Hour Fact	or, PHF		0.9	3 0.93		0.90	0.90		
Hourly Flow Ra	te, HFR		130	37		6	110		
Percent Heavy	Vehicles					100			
Median Type/St	orage	Undiv	ided			/			
RT Channelized	?								
Lanes			2	0		0	1		
Configuration			T	TR		L'	Γ		
Upstream Signa	1?		No				No		
			1. 1				1 1- 1-		
Minor Street:	Approach		rthbo				uthboun		
	Movement	7	8	9	!	10	11	12	
		L	T	R		L	T	R	
 Volume		26		2					
Peak Hour Factor, PHF		0.57		0.57					
Hourly Flow Ra		45		3					
Percent Heavy		96		100					
Percent Grade			0				0		
Flared Approac	h: Exists?	?/Storage		No	/				/
Lanes		Ō		0					
Configuration			LR						
							·		
 Approach	Delay, EB	Queue Le WB	_	ана њеv orthboun		ı serv.		hbound	 1
Movement	1	4	7	8	9	1		11	12
Lane Config	_	LT İ	·	LR	•	i	- •		
v (vph)		6		48					
C(m) (vph)		912		501					
v/c		0.01		0.10					
95% queue leng	th	0.02		0.32					
Control Delay		9.0		12.9					
T 0 0		A		В					
LOS									
LOS Approach Delay				12.9					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: AM Route 33A / Brew Road Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: PROJECTED Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R Volume 121 35 99 6 0.93 Peak-Hour Factor, PHF 0.93 0.90 0.90 9 2 Peak-15 Minute Volume 33 28 130 Hourly Flow Rate, HFR 37 6 110 Percent Heavy Vehicles 100 Median Type/Storage Undivided RT Channelized? Lanes 2 0 0 1 Configuration Τ TR LT Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 2 Volume 26 Peak Hour Factor, PHF 0.57 0.57 Peak-15 Minute Volume 11 1 Hourly Flow Rate, HFR 45 3 Percent Heavy Vehicles 96 100 Percent Grade (%) 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

 Lane Width (ft)
 12.0
 12.0
 12.0
 12.0

 Walking Speed (ft/sec)
 4.0
 4.0
 4.0
 4.0

 Percent Blockage
 0
 0
 0
 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Flow Type Time Speed to Signal Flow Length feet vph vph sec sec mph

S2 Left-Turn

Through

S5 Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared In volume, major th vehicles:		110
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical	Gap Cal	culatio	on						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	T	R
 t(c,base)		4.1	7.5		6.2			
t(c,hv) P(hv)		2.00	2.00	2.00 96	2.00	2.00	2.00	2.00	2.00
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,1t)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage 2-stage		6.1	8.7		8.2			
Follow-U	p Time Ca	alcula	tions						
Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50		3.30			
t(f,HV) P(HV)		1.00	1.00	1.00 96	1.00	1.00	1.00	1.00	1.00

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5 V(t) V(l,prot) V(t) V(l,prot)

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                             (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                     11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                              L
                                                                             R
                               167
                                       270
                                                      84
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

Joagol Joagol Joagol Joagol	on stages stages	22 234901 234902
V(c,x)		
s 1500		
P(x)		
V(c,u,x)		
C(r,x)		
C(plat,x)		
Worksheet 6-Impedance and Capacity Equation	18	
Step 1: RT from Minor St.	9	12
Conflicting Flows	84	
Potential Capacity	727	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	727	
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	<u>4</u>	
	.	<u>.</u>
Conflicting Flows	167	
Potential Capacity	912	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	912	1 00
Probability of Queue free St.	0.99	1.00
Maj L-Shared Prob Q free St.	0.99	
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows	270	
Potential Capacity	494	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	491	
Worksheet 7-Computation of the Effect of ${\tt Tw}$	o-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding	mrrmn+					
	IIIVIIIIIC					
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor		1	.00		1.00	
Cap. Adj. factor due to Impeding	mvmnt	0	.99		0.99	
Movement Capacity						
Result for 2 stage process:						
a						
Y C t						
		1	0.0		1.00	
Probability of Queue free St.		1	.00		1.00	
Step 4: LT from Minor St.			7		10	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding	mzzmn+					
Movement Capacity	III V IIIII C					
movement capacity						
Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding	mrrmn+					
	III V IIIII C					
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows		2	270			
Potential Capacity		4	94			
Pedestrian Impedance Factor		1	.00		1.00	
Maj. L, Min T Impedance factor					0.99	
Maj. L, Min T Adj. Imp Factor.					0.99	
Cap. Adj. factor due to Impeding	mvmnt.	0	.99		0.99	
Movement Capacity			91			
Results for Two-stage process:						
a 						
У		-	0.1			
C t		4	91			
Worksheet 8-Shared Lane Calculati	ons					
 Movement			<u>9</u>	10		<u></u>
INO A CIMCII C	, L	8 T	9 R	L L	T	12 R
Volume (voh)			<u>-</u>			
-	45		3 727			
Volume (vph) Movement Capacity (vph) Shared Lane Capacity (vph)		501	3 727			

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12	
	L	Т	R	L	Т	R	
C sep	491		727				
Volume	45		3				
Delay							
Q sep							
Q sep +1							
round (Qsep +1)							
n max							
C sh		501					
SUM C sep							
n							
C act							

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		6		48				
C(m) (vph)		912		501				
v/c		0.01		0.10				
95% queue length		0.02		0.32				
Control Delay		9.0		12.9				
LOS		A		В				
Approach Delay				12.9				
Approach LOS				В				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		110
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		9.0
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jonathan Walczak

Agency/Co.: Barton & Loguidice, P.C.

Date Performed: 12/17/2013

Analysis Time Period: PM

Intersection: Route 33A / Brew Road

Jurisdiction:

Units: U. S. Customary

Analysis Year: PROJECTED Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road

Intersection Orientation: EW Study period (hrs): 0.25

Major Street:	Approach	nicle Vol Ea	stbound		Westbound				
<u> </u>	Movement	1	2	3		4	5	6	
		L	Т	R	İ	L	T	R	
 Volume			119	6		1	113		
Peak-Hour Fact	or, PHF		0.91	0.91		0.85	0.85		
Hourly Flow Ra	te, HFR		130	6		1	132		
Percent Heavy	Vehicles					100			
Median Type/St		Undiv	ided			/			
RT Channelized	?								
Lanes			2	0		0	1		
Configuration			Т :	ΓR		L'	Γ		
Upstream Signa	1?		No				No		
M				- 1			1 1- 1-		
Minor Street:	Approach		rthbou				uthboun		
	Movement	7	8	9		10	11	12	
		L	Т	R	I	L	T	R	
 Volume		21		3					
Peak Hour Factor, PHF		0.41		0.41					
Hourly Flow Ra		51		7					
Percent Heavy		33		50					
Percent Grade			0				0		
Flared Approac	h: Exists	?/Storage		No	/				/
Lanes		Ō		0					
Configuration			LR						
 Approach	Delay, EB	Queue Le WB	_	and Leve rthbound		f Serv		hbound	
Movement	1	wь 4 I	7	8	9	1		11	12
Lane Config	Τ.	LT	,	LR)				14
24.10 0011119				111		ı			
v (vph)		1		58					
C(m) (vph)		949		641					
v/c		0.00		0.09					
95% queue leng	th	0.00		0.30					
Control Delay		8.8		11.2					
-		А		В					
LOS									
LOS Approach Delay				11.2					

Phone: Fax: E-Mail: TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____ Analyst: Jonathan Walczak Agency/Co.: Barton & Loquidice, P.C. Date Performed: 12/17/2013 Analysis Time Period: PM Route 33A / Brew Road Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: PROJECTED Project ID: Mill Seat Landfill East/West Street: Route 33A North/South Street: Brew Road Intersection Orientation: EW Study period (hrs): 0.25 Vehicle Volumes and Adjustments Major Street Movements 1 2 3 4 L Τ R L Т R 119 113 Volume 6 1 Peak-Hour Factor, PHF 0.91 0.91 0.85 0.85 Peak-15 Minute Volume 33 2 0 33 Hourly Flow Rate, HFR 130 132 6 1 Percent Heavy Vehicles 100 --Median Type/Storage Undivided RT Channelized? Lanes 2 0 0 1 Configuration Τ TR LT Upstream Signal? No No Minor Street Movements 8 9 10 11 12 L Τ R L Τ R 3 Volume 21 Peak Hour Factor, PHF 0.41 0.41 Peak-15 Minute Volume 13 2 Hourly Flow Rate, HFR 7 51 Percent Heavy Vehicles 33 50 Percent Grade (%) 0 Flared Approach: Exists?/Storage No RT Channelized? Lanes 0 Configuration LR Pedestrian Volumes and Adjustments_____ Movements 13 14 15 16

0

Flow (ped/hr)

0

0

0

Lane Width (ft) 12.0 12.0 12.0 12.0 Walking Speed (ft/sec) 4.0 4.0 4.0 4.0 Percent Blockage 0 0 0 0

Upstream Signal Data Prog. Sat Arrival Green Cycle Prog. Distance Flow Type Time Speed to Signal Flow Length feet vph vph sec sec mph

S2 Left-Turn

Through S5 Left-Tu:

Left-Turn Through

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

					Movemer	nt 2	Moveme	ent 5	
Shared ln vo	lume, majo	or th ve	hicles:				132		
Shared ln voi	lume, majo	r rt ve	hicles:				0		
Sat flow rate	e, major t	h vehic	cles:				1700	0	
Sat flow rate	e, major r	t vehic	cles:				1700	0	
Number of mag	jor street	throug	h lanes	:			1		
Worksheet 4-0	Critical G	ap and	Follow-	up Time	e Calcul	lation			
Critical Gap	Calculati	.on							
Movement	1	4	7	8	9	10	11	12	
	L	L	L	Т	R	L	Т	R	
+ (a basa)		/ 1	7 5		6 2				

		L	L	L	Т	R	L	Т	R
t(c,base	 e)		4.1	7.5		6.2			
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv)			100	33		50			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent	Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,1t)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		6.1	7.5		7.2			
	2-stage								

Follow-Up Tim	e Calcula	tions						
Movement	1	4	7	8	9	10	11	12
	L	L	L	Т	R	L	T	R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)		100	33		50			
t(f)		3.2	3.8		3.8			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

Movement 2 Movement 5
V(t) V(l,prot) V(t) V(l,prot)

.....

```
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g (q2)
g (q)
Computation 2-Proportion of TWSC Intersection Time blocked
                                              Movement 2
                                                                 Movement 5
                                           V(t) V(l,prot) V(t) V(l,prot)
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c, max)
Min platooned flow, V(c, min)
Duration of blocked period, t(p)
                                                0.000
                                                                   0.000
Proportion time blocked, p
Computation 3-Platoon Event Periods
                                          Result
                                          0.000
p(2)
                                          0.000
p(5)
p(dom)
p(subo)
Constrained or unconstrained?
Proportion
unblocked
                             (1)
                                             (2)
                                              Two-Stage Process
for minor
                        Single-stage
movements, p(x)
                          Process
                                          Stage I
                                                           Stage II
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
Computation 4 and 5
Single-Stage Process
Movement
                         1
                                4
                                        7
                                               8
                                                       9
                                                             10
                                                                     11
                                                                            12
                         L
                                L
                                        L
                                               Τ
                                                      R
                                                              L
                                                                             R
                               136
                                       267
                                                      68
V c,x
S
Рx
V c,u,x
C r,x
C plat, x
Two-Stage Process
                      7
                                       8
                                                       10
                                                                        11
```

Total Saturation Flow Rate, s (vph)

	, ,	J J
V(c,x)		
1500		
$P(\mathbf{x})$		
7(c,u,x)		
C(r,x)		
C(plat,x)		
Norksheet 6-Impedance and Capacity Equation	S	
Step 1: RT from Minor St.	9	12
Conflicting Flows	68	
Potential Capacity	857	
	1.00	1 00
Pedestrian Impedance Factor		1.00
Movement Capacity	857	4 00
Probability of Queue free St.	0.99	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows	136	
Potential Capacity	949	
Pedestrian Impedance Factor	1.00	1.00
Novement Capacity	949	1.00
Probability of Queue free St.	1.00	1.00
		1.00
Maj L-Shared Prob Q free St.	1.00	
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Novement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
-	, 	
Conflicting Flows	267	
otential Capacity	621	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Novement Capacity	620	5. 5. 5
Norksheet 7-Computation of the Effect of Tw	o-stage Gap Acce	eptance
Step 3: TH from Minor St.	8	11
 Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Can Adi factor due to Impeding mymnt		

Cap. Adj. factor due to Impeding mvmnt

Probability of Queue free St.

Movement Capacity

Stagel Stagel Stagel Stagel Stagel Stagel Stagel

Movement 7 L	8 T	9 R	10 L	11 T	12 R
Worksheet 8-Shared Lane Calculations					
C t		620			
a Y					
Results for Two-stage process:					
Cap. Adj. factor due to Impeding mvmnt Movement Capacity		1.00 620		0.99	
Maj. L, Min T Adj. Imp Factor.		4 00		1.00	
Maj. L, Min T Impedance factor				1.00	
Potential Capacity Pedestrian Impedance Factor		1.00		1.00	
Conflicting Flows Potential Capacity		267 621			
Part 3 - Single Stage		0.67			
Movement Capacity					
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt					
Potential Capacity					
Conflicting Flows					
Part 2 - Second Stage					
Movement Capacity					
Pedestrian Impedance Factor Cap. Adj. factor due to Impeding mvmnt					
Potential Capacity					
Conflicting Flows					
Part 1 - First Stage					
Step 4: LT from Minor St.		- 7		10	
Probability of Queue free St.		1.00		1.00	
Y C t					
a					
Result for 2 stage process:					
Movement Capacity					
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00	
Pedestrian Impedance Factor		1.00		1.00	
Conflicting Flows Potential Capacity					
Part 3 - Single Stage					
Movement Capacity					
Cap. Adj. factor due to Impeding mvmnt					
Pedestrian Impedance Factor					
Potential Capacity					
Conflicting Flows					

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12	_
	L	Т	R	L	Т	R	
C sep Volume Delay Q sep Q sep +1 round (Qsep +1)	620 51		857 7				
n max C sh SUM C sep n C act		641					_

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		1		58				
C(m) (vph)		949		641				
v/c		0.00		0.09				
95% queue length		0.00		0.30				
Control Delay		8.8		11.2				
LOS		A		В				
Approach Delay				11.2				
Approach LOS				В				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		132
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or	5	1700
s(i2), Saturation flow rate for stream 3 or	6	1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		8.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

APPENDIX H

HCM Level of Service Descriptions

11.14 1242.022.013

HCM Level of Service (LOS) Descriptions

Intersection Level of Service (LOS)

LOS A describes driving conditions with average delays of 10 seconds or less per vehicle. When traffic signals are synchronized, this level of service allows for most vehicles to arrive during the green light. The majority of through traffic on the main street does not stop at all.

LOS B describes driving conditions where more vehicles have to stop at red lights and average delays increase up to 20 seconds per vehicle. Synchronized traffic signals can still provide good progression for through traffic on the major street.

LOS C describes driving conditions at intersections where the red signal lights stay on noticeably longer and the average delays per vehicle increases to 35 seconds. At this level of congestion some cars must wait through multiple green lights to get through the intersection. With synchronized traffic signals, some through traffic on the main street can still pass through the intersection without stopping.

LOS D describes congested driving conditions with more stops and delays averaging up to 55 seconds per vehicle. Most cars have to stop at red lights and more vehicles have to wait for more than one green light before passing through the intersection.

LOS E describes very congested driving conditions with delays averaging up to 80 seconds per vehicle. This high congestion allows for very poor progression down the main street and green lights are frequently not long enough to clear stopped vehicles.

LOS F describes very congested driving conditions where the number of vehicles arriving at an intersection exceeds the capacity of the intersection. Average delays exceed 80 seconds and most drivers have to wait for multiple green lights before they get through the intersection. Long queues of left turning vehicles stack out of the left turn pockets and block adjacent through lanes.

Roadway Level of Service (LOS)

LOS A describes driving conditions with average travel speeds around 90 percent of free-flow conditions. Drivers can freely maneuver within the flow of traffic and stopped delay at signalized intersections is minimal.

LOS B describes reasonably unimpeded driving conditions at average travel speeds around 70 percent of free-flow conditions. The ability to maneuver within the flow of traffic is only slightly restricted and stopped delays at signals are not bothersome. Drivers are not generally subjected to appreciable tension under these conditions.

LOS C describes a stable driving environment, however the ability to maneuver and change lanes in midblock locations may feel more restricted. Longer traffic queues begin to build up at signalized intersections and getting through on the green light is getting tighter. Driving speeds drop to 50 percent of free-flow conditions and motorists experience appreciable tension while driving.

LOS D describes driving conditions with substantial delays and travel speeds drop to 40 percent of free-flow conditions. It becomes very difficult to arrive on two green lights in a row and you often have to drive around left turn traffic that has backed out of the left turn pocket and into the through lanes.

LOS E describes driving conditions that are characterized by significant delays and average speeds of one-third of free-flow conditions or less. There are extensive traffic queues at intersections and you have to wait for more than one green to clear the intersection.

LOS F describes extreme congestion with maximum driving speeds of one-third to one quarter of the free-flow conditions. All major signalized intersections are congested with long delays and extensive queues.