REFERENCE LISTS

A

INTRODUCTION

Appendix A includes the source lists comprising the Reference List projects, described in Chapter 3: Transportation System Improvements. The appendix is divided into the following subsections:

- A.1: Culvert Replacement
- A.2: Neighborhood Livability and Safety List
- A.3: Structures List
- A.4: Signal Replacement List
- A.5: 4-R List
- A.6: ITS Improvements List
- A.7: Traffic Calming Lists

Culvert Replacement List (2001, updated 2004)

Number	Culvert Location	Culvert Identification	Total Score	Replacement Cost for Bottomless	Replacement Cost for Bridge
1	SE Flavel Street	JC09	84	$1,231,135	$1,162,752
~~2~~	~~162nd and Foster~~ (complete)	~~JC10~~	~~81~~[1]	~~$800,000~~[1]	
3	SE Brookside Drive	JC07	73	$297,419	$642,646
4	SW Boones Ferry	TC01	73	$1,045,422	$1,408,346
5	SE 45th and Caldew	VC03	67	$566,002	$688,653
6	SW 45th Drive	VC06	67	$3,144,392	$2,615,250
7	NW Cornell Road	BC01	63	$1,324,446	$2,341,613
8	SW Maplecrest Drive	TC04	63	$397,383	$550,667
9	SE Tacoma Street[6]	CS03	62	$382,697	$535,680
10	NW Miller Road	CM03	61	$1,267,381	$1,817,941
11	SE 45th Avenue[1]	JC02	61	$283,693	$450,349
12	SE 162nd Avenue	JC12	61	$522,005	$934,006
13	SW 18th Place	TC05	60	$685,519	$672,749
14	SE Glenwood Street	CS05	60	$270,841	$468,875
15	SW 58th Avenue	FC02	59	$255,283	$304,012
16	SE Mt. Scott Boulevard	JC03	57	$658,545	$695,642
17	SW Hamilton Street	FC03	57	$1,262,961	$955,490
18	SW Dosch Road	FC08	56	$550,988[2] $1,450,585[4]	$728,073[3]
19	SE 28th Avenue	CS06	56	$256,659	$371,963
20	SE 44th Avenue	JC01	55	$170,518	$275,200
21	NW Mill Ridge Road	CM02	55	$968,782	$1,409,351
22	SW 45th Avenue	FC04	55	$280,822	$344,572
23	SW Dosch Road	FC07	55	$1,967,189[5]	$1,850,872[3]
24	SW Arnold Street	TC02	55	$395,293	$478,739
25	SW Lancaster Street	TC09	55	$375,480	$487,368
26	SW Vermont Street	VC01	55	$1,330,543	$1,082,124[3]
30	SE Umatilla[7]	Cs01	54	$400,000	$550,000
37	SE Tenino[8]	Cs02	50	$400,000	$550,000
N/A	Private carport @SE 21st	N/A	N/A	$400,000	$550,000

[1]Applying for funding to modify upstream and downstream portions of culvert rather than replacement culvert
[2]Only includes replacement to connection with FC07
[3]Does not include cost to acquire property and re-contour topography for open channel away from street crossings
[4]Additional to replace to end of FC07
[5]Replaces 655' ± with 655' ± continuous culvert
[6]Applying for Corps grant to replace culvert in 2006 with bottomless culvert
[7]Applying for Corps grant to replace culvert in 2006 with bottomless culvert
[8]Applying for Corps grant to replace culvert in 2005 with bottomless culvert

Neighborhood Livability and Safety Projects
(Updated 2006)

Note: Costs are rough estimates based on potentially old sources. Actual project costs could be more.

NORTH

Project Name	Description	Source (s)	Project Cost
Argyle Way, N, Trail Connection	Complete trail through industrial area north of Columbia using existing sidewalks and signal to connect rowing park and trail on Columbia Slough at Denver	Kenton Downtown Plan	N/A
Brandon Av, N, Stairway	Add stairway connection from Brandon to Columbia, ped signal at Columbia	Kenton Downtown Plan	N/A
Basin, N, Bikeway	Entire length	II-23 (BMP)	$25,000
Bryant St, N (Missouri – Montana: Overpass Improvements	Preliminary engineering to identify potential solutions to improve safety of overpass	I-5 Delta Park community enhancement	$50,000
Columbia Slough Trail, N (Denver – MLK, Jr): Trail Extension	Extend Columbia Slough Tral	I-5 Delta Park community enhancement	$460,000
Denver, N, Pedestrian/Bicycle Improvements	Extend/improve ped/bike connections along Denver north of Interstate/Denver intersection to Columbia Slough and park	Kenton Downtown Plan	N/A
Fenwick St., N, Street Extension	Extend Fenwick to Columbia, relocate signal	Kenton Downtown Plan	N/A
Fessenden, N, St. Louis to Peninsula Crossing	Provide bike lane	II-21 (BMP)	$26,000
Ivanhoe, N Bikeway, St. Louis to Richmond	Provide bike lane	I-49 (BMP)	$7,000
Kenton Downtown, N	Traffic circle and other traffic calming on Denver	I-5 Delta Park community enhancement	$75,000
Lombard, N, Reno to Columbia	Provide bike lane	I-48 (BMP)	$25,000
Peninsula Park Crosswalk, N	Crosswalk on Portland Blvd at Kerby Street to improve access to Peninsula Park	I-5 Delta Park community enhancement	$60,000
Peninsular/Villard, N, Columbia to Ainsworth	Provide bike lane	II-51 (BMP)	$20,000

Portland, N (Vancouver – Montana)	Bicycle facility improvements	I-5 Delta Park community enhancement	$90,000
Portland Blvd, N, Bicycle and Pedestrian Improvements	Add/improve sidewalks and complete bikeway from Willamette to Denver	II-1 (BMP); (TSP WS)	$16,000
Willamette Blvd, N, Pedestrian Improvements	Install sidewalk on bluff side	PMD303 (CIP); NP;WS	$331,000
Willamette Blvd, N, Pedestrian Improvements Options 1 & 2	Install two way paved path on bluff side (8 or 10 feet wide, depending on option)	Swan Island Action Plan (SIAP)	$250,000 - $400,000
Willamette, N Bikeway, Buchanan to Reno	Provide bike lane	II-37 (BMP)	$20,000
Willis & Kilpatrick, N, Portsmouth to Denver	Provide bike lane	II-33 (BMP)	$28,000
Lagoon/Channel, N, Bikeway	Provide bike lane	II-17 (BMP)	$28,000

NORTHEAST

21st/20th, NE, Weidler to Irving	Retrofit bikeway from NE Weidler to NE Irving; Improve bike lane connections along 20th from I-84 to Broadway	I-53b (BMP); (TSP WS)	$4,000
42nd, NE, at Halsey	Improve transit signage to transit center, improve multimodal access at transit center	Hollywood/Sandy Plan	N/A
57th, NE, Bikeway	Extend the bike lane	(TSP WS); I-53a (BMP)	$10,000
Ainsworth, N/NE, Willamette Blvd to 37th	Provide bike lane	I-34 (BMP)	$65,000
Ainsworth,NE	Provide greenstreet	912 (PMP)	$50,000
Alameda, NE, Klickitat to 72nd	Provide bike lane	II-52 (BMP)	$35,000
Bridgeton Neighborhood, NE	Plan, design & construct a ped connection from the Bridgeton Nbhd to Delta Pk; Develop unique identity for NE Bridgeton Street (Greenstreet)	21, 911 (PMP)	$10,000
Couch, NE, Grand to 32nd	Provide bike lane	II-32 (BMP)	$50,000
Fremont, NE 7th – 12th	Marked crosswalks, curb extensions (additional study needed for exact	Traffic Safety Request	N/A

	locations		
Knott St, NE, Bikeway	Stripe bike lanes from N Williams to 39th.	PMD254, II-9 (BMP)	$35,000

FAR NORTHEAST

Outer Fremont, NE, Bicycle and TSM Improvements	Add bike lanes from 102nd-162nd; Complete roadway connections from 148th-162nd	(TE)	$50,000

SOUTHEAST

20th, Harrison	Median Island/barrier	Traffic Safety Request	N/A
28th, SE, Steele to Woodstock	Provide sidewalks.	(TSP WS)	$50,000
36th Pl R.O.W., SE, Francis St to 36th Pl	Construct a 70-m long path in existing 6' wide ROW to enhance the ped network	51 (PMP)	$22,000
41st, SE (Steele – Woodstock)	Traffic calming/pedestrian enhancements	Traffic calming program	$380,000
7th/Sellwood, SE, Spokane to Bybee	Provide bike lane	III-8 (BMP)	$5,000
Creston-Kenilworth Neighborhood, SE	Provide greenstreet	904 (PMP)	$10,000
Crystal Springs, Bybee to Springwater Corridor	Provide bike lane	II-54 (BMP)	$20,000
Division Pl/9th, SE, 7th to Center	Provide bike lane	I-29 (BMP)	$16,000
Gladstone/Center, SE, SE 42nd to 72nd	Provide bike lane	II-48 (BMP)	$15,000
Harrison/Mill, SE, 60th to I-205 trail	Provide bike lane	II-5 (BMP)	$16,000
Salmon/Taylor, SE, SE 52nd to 60th	Provide bike lane	II-31 (BMP)	$40,000
Steele, SE, 26th to 52nd	Provide bike lane	III-38 (BMP)	$20,000
Tolman, SE, 28th to 52nd	Provide bike lane	III-42 (BMP)	$20,000
Woodstock, SE, 52nd – 87th	Mainstreet improvements	597 (PMP)	$800,000

FAR SOUTHEAST

130th - 135th/Salmon to Mill, SE	Provide pedestrian & bike access to David Douglas HS	(NP)	$50,000

130th - 148th/Glisan to Halsey, SE/NE:	Provide pedestrian & bike access to Glendoveer Golf Course	(NP)	$50,000
Ivon Ct, SE, 125th-deadend	Housing/community development project: upgrade existing road to city standards w/ curb, sidewalk, pavement, drainage, street trees	CDS 33 (CIP)	$13,354
Jenne/174th Av & Circle Av, SE (at Springwater Trail)	Street crossing safety improvements	Mult Co Pockets TSP	$7,000
Taylor/Belmont/Yamhill, SE, 44th to I-205 trail	Provide bike lane	II-25 (BMP)	$35,000

NORTHWEST

15th, Glisan	North side of intersection modified to address curb alignment and signal changes	Traffic Safety Request	N/A
26th, NW, Pedestrian Improvements	Improve as City Walkway	(NP)	$50,000
28th, NW, Bicycle Improvements	Connect bike path on Cornell to 28th/Thurman	(NP)	$15,000
29th, NW (Upshur – Thurman)	Provide improved pedestrian connectivity on the NW 29th Avenue right-of-way between NW Thurman and NW Upshur Streets.	Northwest District Plan	NA
Lovejoy, NW, 14th to 24th	Provide bike lane	BMP I-20	$30,000
Overton, NW, 12th - 24th	Provide bike lane	II-26 (BMP)	$20,000
Thurman at Gordon to Aspen, NW, Stairs	Construct stairs & path to replace lost historic stairs in existing ROW; to improve ped travel and access to transit.	PMP 76	$250,000
Upshur/26th-MacLeay Park, NW, Pedestrian Access Improvements	Develop major ped linkages from MacLeay Park	(NP)	$54,000
NW I-405 Bridges: Burnside, Couch, Everett, Glisan.	Add sidewalks where missing and accessibility features	78 (PMP)	N/A

SOUTHWEST

12th/13th, SW, Montgomery to Couch	Install bikeway	I-22 (BMP)	$20,000
14th R.O.W. , SW, College St to Cardinell,	Construct new stairs within the 15' right of way of SW 14th Ave between SW College St and SW Cardinell Dr	65 (PMP)	$50,000
16th, SW, SW Hall to Upper Hall	Construct a series of linked stairways in the SW 16th Ave right of way; design should feature the outstanding viewpoint that would be created and should include references to the squatter colony that existed in this area in the 1930s	64 (PMP)	$80,000
18th, SW (Montgomery – Jackson)	Construct stairway	SW UTP	N/A
18th, SW (Taylors Ferry – Collins)	Construct sidewalk	SW UTP	N/A
19th Ave R.O.W., SW, Troy to Moss	Construct path and stair in umimproved right of way to allow better pedestrian access to Barbur Blvd	61 (PMP), SWUTP	$13,000
19th, SW (Custer – Canby)	Regrade gravel road	SW UTP	N/A
19th, SW (End of I-5 Br – Spring Garden)	Construct sidewalk	SW UTP	N/A
19th, SW (Marigold – Taylors Ferry)	Repair road	SW UTP	N/A
19th, SW (Miles to Custer)	Regrade gravel road	SW UTP	N/A
19th, SW (Moss – Evans)	Repair road	SW UTP	N/A
19th, SW (Nevada Ct – mid block)	Gravel trail	SW UTP	N/A
49th, SW (Comus – Pasadena)	Gravel trail	SW UTP	N/A
51st, SW (Pomona – Capitol Hwy)	Gravel trail	SW UTP	N/A
55th, SW (Vacuna – PCCrd)	Gravel trail	SW UTP	N/A
61st Av, SW (at Canyon Ct)	Pedestrian facilities; add ramp connection to bike path	Mult Co Pockets TSP	$5,000
36th, SW (Canby – Troy)	Gravel trail	SW UTP	N/A
Bancroft, SW (Bancroft Terrace – 6th)	Construct stairs	Portland Aerial Tram	N/A

Boones Ferry, SW (Arnold – Tryon Creek State Park)	Construct sidewalk	SW UTP	N/A
Breyman, SW (Palatine Hill Rd to Hwy 43)	Traffic calming	Mult Co Pockets TSP	$8,500
Cable to Jackson, SW, Pedestrian Improvements	Install stairs to link SW Cable to SW Jackson and restore existing trails	62 (PMP); (TSP WS), SWUTP	$100,000
Canby St, SW, Barbur at 13th	Acquire a public walkway easement and construct path and stair to connect SW Canby St to Barbur Blvd	98 (PMP)	$40,000
Canby, SW (Aprill Hill Park – 60th)	Gravel trail	SW UTP	N/A
Corbett, SW, Pendleton to 1st to Arthur	Provide bike lane	III-41 (BMP)	$20,000
Custer, SW (54th – April Hill Park)	Gravel trail	SW UTP	N/A
Fairmount, SW (Marquam – Mitchell)	Construct sidewalk	SW UTP	N/A
Fairmount, SW (Marquam Pl – Sherwood Pl)	Install sidewalk	SW UTP	N/A
Gibbs, SW (2nd – Hood)	Improvements identified by residents; landscaping, sidewalks, lighting, street furniture, crossings, street trees	Portland Aerial Tram	N/A
Hamilton, SW, Terwilliger to Corbett	Provide bike lane	II-38 (BMP)	$1,000
Harrison (end of) at 16th, SW,Stairs	Construct new public stairway within the right of way to link SW Harrison and SW 16th	63 (PMP)	$10,000
Iowa, SW (Iowa – Barbur)	Repair railroad tie stairway	SWUTP	N/A
Kingston, SW, Jefferson to Knights	Provide bike lane	III-9 (BMP)	$40,000
Lee, SW (35th – Lee)	Gravel trail	SW UTP	N/A
Lobelia St R.O.W., SW, 5th Ave to Boones Ferry	Construct a path in the existing right of way to link Terwilliger and Boones Ferry Rd	84 (PMP)	$55,000
Maricara, SW (at 35th)	Pedestrian crossing improvements	SW UTP	N/A
Montgomery, SW, 11th to Council Crest	Provide bike lane	III-40 (BMP)	$7,000

Nevada Ct, SW (at Capitol Hwy)	Design and construct a pedestrian crossing improvement. Consider pedestrian bridge option in project development.	SW UTP	N/A
OHSU, SW, Pedestrian and Bicycle Improvements	Install bikeway from Terwilliger to Sam Jackson Park Rd	III-35 (BMP)	$7,000
Radcliff, SW (end of Radcliff – Lewis and Clark College trail)	Gravel trail and identification signage	SW UTP	N/A
Red Electric Trail, SW	Pedestrian pathway and greenstreet in former Red Electric ROW	905 (PMP), SWUTP	$1,700,000
Shattuck, SW (Julia – 53rd public easement)	Pedestrian crossing improvement	SW UTP	N/A
Slavin, SW to Barbur	Install pedestrian connection (and auto connection, if feasible) from Slavin - Barbur	(NP); (TSP WS)	$30,000
Spiral Way R.O.W., SW, Stairs	Construct a concrete stairway in existing 16' ROW between SW Vista and SW Montgomery	72 (PMP)	$60,000
Summerville Av, SW (Riverdale Rd to Palatine Hill Rd)	Add a pedestrian off-street path with stairs	Mult Co Pockets TSP	$7,000
Terwilliger Pl, SW (Terwilliger Bl- Terwilliger Pl)	Signage and trail identification	SW UTP	N/A
Terwilliger, SW, Palater to City Limit	Provide bike lane	III-24 (BMP)	$9,000
Talbot, SW (Patton – Fairmount)	Construct sidewalk	SW UTP	N/A
Troy, SW (28th – Canby)	Construct sidewalk	SW UTP	N/A
Troy, SW (at Capitol Hwy)	Pedestrian crossing improvement	SW UTP	N/A
Vermont, SW, 45th to Terwilliger	Provide bike lane	III-11 (BMP)	$36,000
Vermont/Chestnut, St, Terwilliger - 45th	Provide bike lane on Vermont & Chestnut	BMP III-16	$36,000
Virginia, SW, Taylors Ferry to Pendleton	Provide bike lane	III-44 (BMP)	$12,000

Vista Ave to Mill St Terrace, NW, Vista Ridge Stairs	Acquire public walkway easement and construct stairs between existing path & SW Mill St Terrace, to connect existing off-street pedestrian network & improve access to light rail	71 (PMP)	$60,000
Whitaker, SW (Barbur – Stairway)	Pedestrian crossing Improvement	SW UTP	N/A
Woods to Sam Jackson Parkway, SW	Construct path and stairway	93 (PMP), SW UTP	$30,000
Southwest Pedestrian Connections Project	Plan, design & construct ped connections in SW Ptld to facilitate ped access to schools, parks, shopping, employment, & transit	85 (PMP)	$750,000

CENTRAL CITY

Project Name	Description	Source (s)	Project Cost
2nd & 3rd, SW, Jefferson to Couch	Provide bike lane	I-8 (BMP)	$15,000
1st, SW, Jefferson to Arthur	Provide bike lane	I-17 (BMP)	$10,000
5th/6th/Broadway, SW, Pedestrian Crossing Improvement	Provide improved pedestrian crossing	(TSP WS)	$5,000
Broadway, SW, Burnside to Jefferson	Provide bike lane	I-2 (BMP)	$8,000
Clay/17th-PSU, SW, Pedestrian Access Improvements	Improve ped/bike connections between PSU & 17th/Clay	(NP)	N/A
I-405 Bridges, SW: Salmon, Columbia, Jefferson, Taylor	Add sidewalks where missing and accessibility features	79 (PMP)	N/A
Jackson SW, 6th	Curb extension on west side of SE 6th and increase width of median island	Traffic Safety Request	$35,000
Naito, NW at Glisan	Signalized pedestrian and bicycle crossing, sidewalk improvements, street lighting to provide acces to Waterfront Park	PDOT Director Directive (Steel Bridge Walkway Closure)	$650,000

CITY WIDE

Project Name	Description	Source (s)	Project Cost
Bikeway Network Completion, CW	Construction to close gaps in existing bikeways; to improve the bike network and increase the use of bicycles	TOD 212 (CIP)	$200,000
Pedestrian Access to Transit, CW	Design and construct pedestrian improvements to enhance pedestrian access to transit facilities	PED 902 (CIP); (CCTMP)	$100,217
Pedestrian Crossing Projects, CW	Citywide project to select sites annually to improve crossing conditions for pedestrians	PMD 121 (CIP); 9000 (PMP); (CCTMP)	$175,000

Traffic Operations Improvements, CW	Combined improvements at locations needing both safety & operation improvements; include widening, realignment, channelization, signals, landscaping, pedestrian/bike improvements, & ROW acquisition	TDS 310 (CIP)	$1,895,000

Sources Abbreviations:
BMP: Bicycle Master Plan
CCTMP: Central City Transportation Management Plan
CIP: Capital Improvement Plan
NP: Neighborhood Plan
PMP: Pedestrian Master Plan
SWUTP: Southwest Urban Trails Plan
TSP WS: Transportation System Plan Workshop

STRUCTURES IMPROVEMENT LISTS

Bridges Eligible for Replacement (2002)
- Sufficiency Rating less than 50 -

COP #	ODOT#	Location or Route	Feature Crossed	Estimated Replacement Costs
38	25B38	S.W. CANYON RD.	S.W. JEFFERSON ST.	$640,000
145	06683C	STEEL BRIDGE - E SIDE RAMP (From LRT)	UPRR TRACKS	$1,791,800
084A	25T12A	N.E. 33RD AVE. (WEST HALF)	COLUMBIA SLOUGH	$990,000
146	06683D	STEEL BRIDGE - E SIDE RAMP (From Interstate)	UPRR TRACKS	$2,544,000
98	51C19	S.E. LAMBERT ST.	JOHNSON CREEK	$84,000
9	2484	N.E.33RD AVE.	N.E LOMBARD ST. & UPRR TRACKS	$4,408,400
			TOTAL	$10,458,200

Bridges Eligible for Rehabilitation (2002)
- Sufficiency Rating between 50 and 70 -

COP#	ODOT#	Location or Route	Feature Crossed	Estimated Replacement Cost	Estimated Rehabilitation Cost
6	25B06	N. VANCOUVER AVE.	UPRR TRACKS	$4,640,680	$3,480,510
14	25B14	N.W. ALEXANDRA AVE.	UNNAMED CREEK	$1,224,000	$918,000
8	25B08	N.E. 21ST AVE.	COLUMBIA SLOUGH	$1,444,800	$1,083,600
81	25T01	S.W. CAPITOL HIGHWAY	S.W. BERTHA BLVD.	$1,748,000	$1,311,000
80	11086	S.E. FOSTER RD. (SOUTH HALF)	JOHNSON CREEK	$187,320	$140,490
15	25B15	N.W. THURMAN ST.	BALCH CREEK	$3,200,000	$2,400,000
153	7115	N. INTERSTATE AVE. RAMP - M.P. 1.06	RAMP - SB INTERSTATE TO BROADWAY BR RAMPS	$7,994,000.00	$5,995,500
58	25B58	S.E. OCHOCO ST.	JOHNSON CREEK	$264,000	$198,000
25	7039	N.E. 12TH AVE.	UPRR TRACKS & I-84 FREEWAY	$3,924,000	$2,943,000
12	25B12	N. GOING ST. - SWAN ISLAND	UPRR TRACKS	$5,562,480	$4,171,860
18	25B18	N.W. MAYWOOD DRIVE SEMI-VIADUCT	HILLSIDE NEAR N.W. MELINDA DR.	$1,055,700	$791,775
17	25B17	N.W. MAYWOOD DRIVE SEMI-VIADUCT	HILLSIDE NEAR W. BURNSIDE ST.	$310,000	$232,500
42	25B42	S.W. GREENWAY	S.W. TALBOT RD.	$233,240	$174,930
82	25T03	S.W. CAPITOL HIGHWAY	S.W. MULTNOMAH BLVD.	$2,329,860	$1,747,395
75	2485	N.E. 42ND AVE.	N.E PORTLAND HWY. & U.P.R.R TRACKS	$2,254,460	$1,690,845
16	7025	N.E. 33RD AVE.	UPRR/LRT TRACKS	$1,164,000	$873,000
7	25B07	N. WILLAMETTE BLVD. SEMI-VIADUCT	SLOPED HILLSIDE	$994,400	$745,800
87	51C01	S.E. TACOMA ST.	SPRINGWATER RECREATIONAL TRAIL	$1,401,800	$1,051,350
				TOTAL	$ 29,949,555

Notes:

- The Sufficiency Rating system is used to evaluate potential bridge projects. This system is based on that used by Oregon Department of Transportation. This rating considers structural condition, functional serviceability, safety, community needs and economics. A SR rating of 50 or less indicates from the middle of the "poor" to the "very poor" range.
- Rehabilitation is estimated as being 75% of Replacement Costs.

Top Ten Seismic Retrofit Projects Ranked by Priority Index (2004)

COP #	ODOT#	*Location or Route*	*Feature Crossed*	*Estimated Rehabilitation Cost*	Estimated Replacement Cost
12	25B12	N.GOING ST. - SWAN ISLAND	UPRR TRACKS	$140,000.00	$1,200,000.00
25	07039	N.E. 12TH AVE.	UPRR TRACKS & I-84	$345,678.00	$749,664.00
9A	02484A	N.E. 33RD AVE. RAMP	N.E. COLUMBIA BLVD.	$291,536.00	$1,874,160.00
21	07029A	N.E. HALSEY ST.	UPRR/LRT TRACKS & I-84	$166,592.00	$104,120.00
10	25B10	N.W. KITTRIDGE AVE.	BNRR TRACKS	$374,832.00	$1,124,496.00
139	08551	S.W. CAPITOL HIGHWAY-M.P. 6.72	S.W. BARBUR BLVD.	$345,678.00	$1,874,160.00
31A	07028B	N.E.60TH AVE.	LRT & I-84 FREEWAY	$ ---	$156,180.00
153	07115	N. INTERSTATE AVE. RAMP-M.P.	RAMP - SB INTERSTATE TO BROADWAY BR	$528,930.00	$2,623,824.00
78A	09685A	N. COLUMBIA BLVD.	B.N.R.R. TRACKS	$220,734.00	$374,832.00
79	09752	N. COLUMBIA BLVD.	N. COLUMBIA WAY	$ ---	$749,664.00
			SUB-TOTAL	$2,413,980.00	$10,831,100.00
				TOTAL	$13,245,080.00

Notes:

- Estimate made by updating 1994 consultant estimates to 2002 @ 4% inflation per year. Added 12% to cost for PE and 15% for CE. Added 20% contingency.

Other Priority Structure Replacement needs (2004)

RTP #	Location or Route	Feature Crossed	Reconstruction Cost	Replacement Cost
4063	N LOMBARD STREET TO N MARINE DR	COLUMBIA SLOUGH	$4,925,889	

Signalized Intersections in Critical Need of Replacement

Revised February 13, 2001

	Intersection	Intersection Age in Years	Remodel Date	Int. ID#	Remodel Votes	Comments
1	E.Burnside, 12th & Sandy	33	1968	4	1	
2	N. Albina Ave & Alberta St	40	1961	1001	0	
3	N. Broadway St & Vancouver Ave	39	1962	1009	3	
4	N. Broadway St & Williams Ave	38	1963	1008	3	
5	N. Denver Ave & Portland Blvd	35	1966	1013	0	
6	N. Interstate Ave & Ainsworth St	39	1962	1030	0	
7	N. Interstate Ave & Alberta St	39	1962	1027	0	
8	N. Interstate Ave & Argyle St	39	1962	1033	0	
9	N. Interstate Ave & Shaver St	39	1962	1025	0	
10	N. Lombard St & Albina Ave	29	1972	1036	0	
11	N. Lombard St & Denver Ave	29	1972	1037	0	
12	N. Lombard St & Fiske Ave	29	1972	1042	0	
13	N. Lombard St & Portsmouth Ave	29	1972	1043	0	
14	N. Lombard St & St. Louis Ave	29	1972	1049	0	
15	N. Lombard St & Wabash Ave	29	1972	1039	0	
16	N. Mississippi Ave & Russell St	49	1952	1050	1	
17	N. Williams Ave & Alberta St	49	1952	1073	0	
18	NE Ainsworth St & 33rd Ave	39	1962	2107	0	
19	NE Alberta St & 15th Ave	36	1965	2100	0	
20	NE Alberta St & 33rd Ave	39	1962	2105	0	
21	NE Alberta St & 7th Ave	29	1972	2126	0	
22	NE Broadway St & 21st Ave	18	1983	2005	3	
23	NE Broadway St & 24th Ave	41	1960	2006	3	
24	NE Broadway St & Victoria Ave	40	1961	2001	3	
25	NE Columbia Blvd & Alderwood Rd	21	1980	2200	0	
26	NE Columbia Blvd & Cully Blvd	21	1980	2198	0	
27	NE Dekum St & 15th Ave	30	1971	2124	0	
28	NE Fremont St & 24th Ave	49	1952	2015	1	
29	NE Fremont St , 41st/ 42nd Ave	22	1979	2016	0	
30	NE Glisan St & 67th Ave	35	1966	2023	1	
31	NE Glisan St & 74th Ave	35	1966	2121	1	
32	NE Halsey St & 111th Ave	46	1955	2169	2	
33	NE Halsey St & 53rd Ave	32	1969	2069	0	
34	NE Halsey St & 60th Ave	16	1985	2034	0	
35	NE Halsey St & 9th Ave	29	1972	2127	0	
36	NE Irving St & 12th Ave	41	1960	2098	1	
37	NE Killingsworth St & 20th Ave	27	1974	2130	0	
38	NE Lombard St & 11th Ave	21	1980	2138	0	
39	NE MLK & Columbia (Detection)	3	1998	2090	0	
40	NE Multnomah St & 15th Ave	41	1960	2046	0	
41	NE Multnomah St & 21st Ave	41	1960	2048	0	
42	NE Prescott St & 42nd Ave	41	1960	2109	0	
43	NE Prescott St & 7th Ave	29	1972	2125	0	
44	NE San Rafael St & 122nd Ave	31	1970	2167	1	
45	NE San Rafael St & 138th Pl	2001		2185	0	
46	NE Sandy Blvd & 16th Ave	39	1962	2050	0	HEP project
47	NE Sandy Blvd & 20th Ave	38	1963	2051	0	HEP project
48	NE Sandy Blvd & 24th Ave	38	1963	2052	0	HEP project
49	NE Sandy Blvd & 33rd Ave	38	1963	2054	0	HEP project
50	NE Sandy Blvd & 52nd Ave	38	1963	2061	1	
51	NE Sandy Blvd & 57th Ave	38	1963	2062	3	
52	NE Sandy Blvd & 62nd Ave	38	1963	2063	1	
53	NE Sandy Blvd & 67th Ave	38	1963	2064	1	
54	NE Sandy Blvd & 77th Ave	38	1963	2066	1	
55	NE Sandy Blvd & Prescott St	36	1965	2206	2	
56	NE Sandy , 72nd & Fremont	38	1963	2065	2	
57	NE Webster St & 82nd Ave	41	1960	2146	0	Just done? Work order?
58	NE Weidler St & 111th Ave	44	1957	2177	2	
59	NE Weidler St & 21st Ave	41	1960	2096	2	

	Intersection	Intersection Age in Years	Remodel Date	Int. ID#	Remodel Votes	Comments
60	NE Weidler St & Victoria Ave	37	1964	2091	3	
61	NW 14th & Everett St	33	1968	3010	0	
62	NW 14th & Glisan St	33	1968	3021	0	
63	NW 16th & Everett St	33	1968	3011	0	
64	NW 16th & Glisan St	32	1969	3022	0	
65	NW 18th & Marshall St	48	1953	3038	0	Removal
66	NW 23rd Ave & Thurman St	39	1962	3046	0	
67	NW 2nd Ave & Everett St	1	2000	3002	0	
68	NW 3rd Ave & Everett St	1	2000	3003	0	
69	NW 4th Ave & Everett St	28	1973	3004	0	
70	NW St Helens Rd & 105th Ave	23	1978	3074	1	Future ODOT proj.
71	NW St Helens Rd & 107th Ave	37	1964	3042	1	Future ODOT proj.
72	NW St Helens Rd & Bridge Ave	37	1964	3041	0	
73	NW St Helens Rd & Bridge Ave	22	1979	3075	0	
74	SE Belmont St & 30th Ave	29	1972	4005	3	
75	SE Belmont St & 39th Ave	51	1950	4097	3	
76	SE Belmont St & 60th Ave	39	1962	4008	4	
77	SE Bybee Blvd & 17th Ave	42	1959	4010	0	
78	SE Cherry Blossom Dr & 106th Ave	4	1997	4150	0	
79	SE Clay St & 7th Ave	29	1972	4119	1	
80	SE Clinton St & 39th Ave	29	1972	4095	2	
81	SE Cora St & 130th Ave	2001		4180	0	
82	SE Division St & 168th Ave	31	1970	4206	0	
83	SE Division St & 17th Ave	32	1969	4021	0	
84	SE Division St & 26th Ave	29	1972	4015	0	
85	SE Division St & 34th Ave	29	1972	4016	0	
86	SE Division St & 52nd Ave	38	1963	4018	1	
87	SE Division St & 71st Ave	42	1959	4020	0	
88	SE Gladstone St & 39th Ave	50	1951	4100	3	
89	SE Grand Ave & Ankeny St	22	1979	4028	0	
90	SE Harold St & 122nd Ave	11	1990	4221	0	
91	SE Hawthorne Blvd & 11th Ave	44	1957	4038	1	
92	SE Hawthorne Blvd & 27th Ave	36	1965	4036	1	Hawthorne Main St?
93	SE Hawthorne Blvd & 37th Ave	30	1971	4043	0	Hawthorne Main St?
94	SE Hawthorne Blvd & 50th Ave	40	1961	4045	1	Hawthorne Main St?
95	SE Hawthorne Blvd & 7th Ave	30	1971	4037	2	
96	SE Holgate Blvd & 104th Ave	4	1997	4163	0	
97	SE Holgate Blvd & 112th Ave	31	1970	4172	0	
98	SE Holgate Blvd & 28th Ave	20	1981	4048	1	
99	SE Holgate Blvd & 32nd Ave	27	1974	4132	1	
100	SE Holgate Blvd & 52nd Ave	29	1972	4103	1	
101	SE Holgate Blvd & 72nd Ave	28	1973	4051	2	
102	SE Johnson Creek Blvd & 45th Ave	28	1973	4128	2	
103	SE Lincoln St & 39th Ave	47	1954	4098	3	
104	SE Lincoln St & 50th Ave	29	1972	4126	0	
105	SE Main St & 148th Ave	2001		4198	0	
106	SE Main St & 162nd Ave	36	1965	4199	0	
107	SE Main St & 174th Ave	2001		4217	0	
108	SE Main St & 39th Ave	20	1981	4092	1	
109	SE Market St & 112th Ave	31	1970	4162	0	
110	SE Market St & 130th Ave	2001		4175	0	
111	SE McLoughlin Blvd & Boise	30	1971	4129	1	
112	SE McLoughlin Blvd & Bybee Blvd	35	1966	4131	0	
113	SE Mill St & 135th Ave	22	1979	4200	0	
114	SE Mill St & 82nd Ave	31	1970	4118	0	
115	SE Mill St+B24 & 148th Ave	6	1995	4201	0	
116	SE Powell Blvd & 112th Ave	2001		4178	0	
117	SE Stark St & 117th Ave	31	1970	4171	0	
118	SE Stark St & 130th Ave	26	1975	4192	0	
119	SE Stark St & 33rd Ave	49	1952	4082	2	

	Intersection	Intersection Age in Years	Remodel Date	Int. ID#	Remodel Votes	Comments
120	SE Stark St & 92nd Ave	30	1971	4122	0	
121	SE Steele St & 52nd Ave	29	1972	4104	0	
122	SE Tacoma St & 13th Ave	33	1968	4086	0	
123	SE Tacoma St & 17th Ave	33	1968	4087	0	
124	SE Taylor St & 39th Ave	47	1954	4602	1	
125	SE Washington St & 76th Ave	30	1971	4120	0	
126	SE Woodstock Blvd & 46th Ave	33	1968	4094	0	
127	SW 12th Ave & Alder St	29	1972	5198	0	
128	SW 12th Ave & Columbia St	33	1968	5047	0	
129	SW 12th Ave & Jefferson St	33	1968	5069	0	
130	SW 12th Ave & Main St	35	1966	5184	0	
131	SW 12th Ave & Market St	35	1966	5084	0	
132	SW 12th Ave & Salmon St	33	1968	5186	0	
133	SW 12th Ave & Taylor St	27	1974	5214	0	
134	SW 13th Ave & Alder St	29	1972	5189	0	
135	SW 13th Ave & Market St	32	1969	5204	0	
136	SW 13th Ave & Salmon St	32	1969	5191	0	
137	SW 14th Ave & Salmon St	32	1969	5193	0	
138	SW 1st Ave & Arthur St	22	1979	5099	0	FY2000 remodel
139	SW 1st Ave & Clay St	30	1971	5028	0	
140	SW 1st Ave & Harrison St	34	1967	5058	0	FY2000 remodel
141	SW 1st Ave & Lincoln St	31	1970	5072	0	FY2000 remodel
142	SW 1st Ave & Taylor St	24	1977	5095	0	
143	SW 3rd Ave & Clay St	32	1969	5030	0	
144	SW 4th Ave & Hall St	25	1976	5224	0	FY2000 remodel
145	SW 4th Ave & Harrison St	36	1965	5059	0	FY2000 remodel
146	SW 5th Ave & Clay St	44	1957	5032	0	
147	SW 5th Ave & Sheridan St	16	1985	5151	0	
148	SW 6th Ave & Clay St	28	1973	5033	0	
149	SW 6th Ave & College St	27	1974	5226	0	
150	SW 6th Ave & Columbia St	30	1971	5044	0	
151	SW 6th Ave & Hall St	34	1967	5206	0	
152	SW 6th Ave & Market St	28	1973	5080	0	Streetcar
153	SW Broadway & Montgomery St	29	1972	5022	0	
154	SW Broadway Ave & Clay St	28	1973	5034	0	
155	SW Broadway Ave & Columbia St	30	1971	5021	0	
156	SW Broadway Ave & Hall St	34	1967	5207	0	
157	SW Broadway Ave & Harrison St	31	1970	5218	0	
158	SW Broadway Ave & Jackson St	28	1973	5227	0	
159	SW Broadway Ave & Jefferson St	30	1971	5081	0	
160	SW Broadway Ave & Market St	30	1971	5081	0	Streetcar
161	SW Broadway Dr & Hoffman Ave	32	1969	5023	1	
162	SW Stephenson St & 27th Pl	20	1981	5085	0	
163	SW Terwilliger & Boone's Ferry	28	1973	5223	0	
164	SW Vista Ave & Park Pl	35	1966	5089	0	
165	W Burnside St & 14th Ave	34	1967	20	0	
166	W Burnside St & 15th Ave	28	1973	26	0	
167	W Burnside St & 16th Ave	34	1967	21	0	
168	W Burnside St & 19th Ave	34	1967	23	0	
169	W Burnside St & 21st Ave, I-5	34	1967	24	0	
170	W Burnside St & 3rd	26	1975	14	1	Issue of W Burnside study
171	W Burnside St & 4th	26	1975	15	1	Issue of W Burnside study
172	W Burnside St & 5th	26	1975	16	1	Issue of W Burnside study
173	W Burnside St & 6th	26	1975	17	1	Issue of W Burnside study
174	W Burnside St & Broadway	26	1975	18	1	Issue of W Burnside study

Arterial Streets in Need of 4R Work in Priority Order
By Dick Godfrey Feb. 5, 1998

Street Name	Section	Work Needed	Overlay Required	Len. - Miles	Sq. Yd.	Cost	Est. RTP
SW NAITO PARKWAY	I-405 to Burnside	Rebuild	----	1	35,521	3,000K	3.03 million
W BURNSIDE ST	I-405 to 23rd Ave	Rebuild	----	0.58	14,509	4,000K	9.37 million
SE DIVISION ST	6th Ave to 53rd Ave	verlay/Rebuild	3.0"	2.59	59,589	1,500K	5.9 million
N HAYDEN ISLAND DR	Jantzen to Farr Rd	Rebuild	----	0.54	15,427	600K	
SW COLUMBIA ST	18th Ave to Naito Parkway	Rebuild	1.5 to 5.4"	0.84	18,859	800K	0.8 million
NW 23RD AVE	Burnside to Lovejoy	Rebuild	----	1.44	9,662	500K	0.5 million
SE STARK ST	122nd to 146th	Overlay	3"+	1.2	44,553	700K	
SE 39TH AVE	Burnside to Holgate	Rebuild Parts	3"+	2.26	60,167	2,000K	
N MARINE DR	Kelly Point Park to New Construction	Rebuild	----	2.61	56,744	2,000K	
SW PARK/10TH COUPLET	SW 10th Ave – Montgomery St to Clay St	Rebuild Parts	3.0' to 6.0"	0.3	6,395	275K	
	SW Park Ave – Montgomery St to Clay St						
NE CULLY BLVD	Killingsworth to Columbia Blvd	Rebuild Parts	2.5"+	0.33	5,233	250K	
SE HOLGATE BLVD	42nd to 52nd	Rebuild	----	0.49	9,325	600K	
SW 6TH AVE	Sheridan St to College St	Overlay	4.8" to 5.4"	0	7,097	110K	
SW 4TH AVE	I-405 to Madison St	Overlay	1.5" to 6.0"	0.62	17,012	225K	
SW MAIN ST	Broadway to 1st Ave	Overlay	1.5" to 6.0"	0.31	6,600	500K	?
SW SALMON/PARK	SW King Ave – Salmon St to Park Pl	Overlay	1.8" to 6.0"	0.35	7,552	350K	
	SW Park Pl – Vista Ave to King Ave						
	SW Salmon St – 18th Ave to King Ave						
SE WASHINGTION	82nd to 109th	Overlay	2.5"	1.24	30,166	400K	
			TOTAL	**16.23 Miles**	**404,411 S.Y.**	**$17,810K**	

All estimates are preliminary and should be considered very rough.

List of ITS Corridor Projects for CIP Consideration – Listed in Rank Order (Revised November 2004)

Rank	Route	Parallel Route to Freeway	Max Points 15	CoP Operation	Max Points 5	Life/ Safety Route	Max Points 5	Connection to Centers Identified in 2040 Growth Concept	Max Points 10	Traffic Volumes 1,000	Max Points 10	Transit Route	Max Points 5	Truck Route	Max Points 5	Max Total Points 55
1	NE Sandy Blvd. (Burnside-I-205)	Yes:(I-484E)	15	Yes-82nd	4	Yes	5	Yes: Central City, Hollywood	10	16-30	8	Major	4	Major	4	50
2	NE MLK/ Grand	Yes:(I-5 N)	15	Yes	5	Yes	5	Yes: Central City, Regional Industrial	10	18-26	7	Major	4	Major	4	50
3	W Burnside	Yes:(US26)	15	Yes	5	Yes	5	Yes: Central City, 217	8	20-35	10	Major	4	No	0	47
4	NE/N Broadway/ Weidler(Br.-37th)	Yes:(I-84E)	15	Yes	5	No	0	Yes: Central City, Hollywood	10	25-62	10	Major	4	Minor	2	46
5	SW Beaverton-Hills/Capitol Hwy	Yes:(US26)	12	Yes	5	No	0	Yes: Hillsdale, Scholls, Beaverton	10	20-26	8	Major	4	Major	4	43
6	NE 82nd	Yes:(I-205)	10	Yes	5	Yes	5	Yes: International Airport	8	16-25	7	Major	4	Major	4	43
7	NE Sandy St.(East of I-205)	Yes:(I-84E)	15	Yes	0	Yes	5	Yes: Regional Industrial Center	8	13-25	6	Major	4	Major	4	42
8	NE Halsey St (East of 39th)	Yes:(I-84E)	15	Yes	5	No	0	Yes: Hollywood, Gateway	10	10-27	6	Minor	2	Major	4	42

Rank	Route	Parallel Route to Freeway	Max Points 15	CoP Operation	Max Points 5	Life/ Safety Route	Max Points 5	Connection to Centers Identified in 2040 Growth Concept	Max Points 10	Traffic Volumes 1,000	Max Points 10	Transit Route	Max Points 5	Truck Route	Max Points 5	Max Total Points 55
9	N Interstate Ave.	Yes:(I-5N)	15	Yes	5	No	0	Yes: Central City, Industrial	8	10-15	4	Reg. LRT?	5	Major	4	41
10	NE Lombard St./Killingsworth	Yes:(I-84E)	12	Yes	5	No	0	Yes: Regional Industrial	8	16-32	8	Major	4	Maj E 60th	4	41
11	NE Glisan St.	Yes:(I-84)	15	Yes	5	No	0	Yes: Gateway	8	18-37	9	Minor	2	No	0	39
12	NE 102nd Ave	Yes:(I-205)	12	Yes	5	No	0	Yes: Gateway, Regional Industrial	10	5-23	4	Major	4	Major	4	39
13	N Columbia Blvd.	Partial:(I-4E)	8	Yes	5	No	0	Yes: Regional Industrial	10	10-25	6	Major	4	Regional	5	38
14	NE Columbia Blvd.	Partial:(I-4E)	10	Yes	5	No	0	Yes: Regional Industrial	8	20-28	8	Minor	2	Regional	5	38
15	SE McLoughlin Blvd.	No:	0	Yes	5	Yes	5	Yes: Central City, Milwaukie	8	50-71	10	Regional	5	Regional	5	38
16	SE Powell Blvd.	Partial:(I-4E)	8	Yes	5	No	0	Yes: Central City, Gresham	8	20-53	10	Minor	2	Major	4	37
17	E Burnside St.	Partial:(I-4E)	8	Yes	5	Yes	5	Yes: Central City, 182nd, Gresham	10	8-17	4	Reg. LRT?	5	No	0	37
18	SE 82nd Ave.	Partial:(I-05)	10	Yes	5	No	0	Yes: Clackamas Town Center	5	20-35	9	Major	4	Major	4	37
19	SW Macadam Ave.	Partial:(I-5S)	8	Yes	5	No	0	Yes: Central City	5	30-41	10	Major	4	Major	4	36
20	SE Stark/Washington(82nd-E CL)	Partial:(I-4E)	10	Yes	5	No	0	Yes: 182nd	5	25-45	10	Minor	2	Major	4	36

Rank	Route	Parallel Route to Freeway	Max Points 15	CoP Operation	Max Points 5	Life/ Safety Route	Max Points 5	Connection to Centers Identified in 2040 Growth Concept	Max Points 10	Traffic Volumes 1,000	Max Points 10	Transit Route	Max Points 5	Truck Route	Max Points 5	Max Total Points 55
21	N Going St.	No:	0	Yes	5	No	0	Yes: Regional Industrial	10	27-38	10	Major	4	Major	4	33
22	NW Yeon/St.Helens	No:	0	No	0	Yes	5	Yes: Central City, Industrial	8	35-38	10	Major	4	Regional	5	32
23	N Lombard St.	Yes:(I-84E)	12	Yes	5	No	0	Yes: St. Johns	5	15-22	6	Major	4	No	0	32
24	NE 122nd Ave.	Partial:(I-205)	8	Yes	5	No	0	Yes: Regional Industrial	5	15-23	6	Major	4	Major	4	32
25	SE 122nd Ave.	Partial:(I-205)	8	Yes	5	No	0	No	0	10-26	6	Major	4	Major	4	27
26	SE Division St.	No:	0	Yes-162nd	4	No	0	Yes: Gresham	5	25-35	10	Major	4	Minor	2	25
27	NE 33rd Ave.(Sany-Columbia Blvd.)	No:	0	Yes	5	No	0	Yes: Hollywood, Regional Industrial	8	10-23	5	Major	4	Minor	2	24
28	SE/NE 39thAve.(Woodstock-Sandy)	No:	0	Yes	5	No	0	Yes: Hollywood	5	12-22	6	Major	4	Minor	4	24
29	N Greeley (Interstate Av-Lombard)	No:	0	Yes	5	No	0	Yes: Regional Industrial	8	10-27	6	Major	4	No	0	23
30	SE Foster Rd.	No:	0	Yes	5	No	0	Yes: Lents	5	15-28	7	Maj to I-205	3	Minor	2	22
31	SE Tacoma St.	No:	0	Yes	5	No	0	No	0	10-32	7	Major	4	Minor	2	18

List of ITS Projects for CIP Consideration – listed by Quadrant (Revised November 2004) A.6

Route	Parallel Route to Freeway	Max Points 15	CoP Operation	Max Points 5	Life/ Safety Route	Max Points 5	Connection to Centers Identified in Metro's 2040 Plan	Max Points 10	Traffic Volumes 1,000	Max Points 10	Transit Route	Max Points 5	Truck Route	Max Points 5	Max Total Points 55
SW Macadam Ave.	Partial:(I-5S)	8	Yes	5	No	0	Yes:Central City	5	30-41	10	Major	4	Major	4	36
SW Beaverton-Hills/Capitol Hwy	Yes:(US26)	12	Yes	5	No	0	Yes:Hillsdale, Scholls, Beaverton	10	20-26	8	Major	4	Major	4	43
W Burnside St.	Yes:(US26)	15	Yes	5	Yes	5	Yes:Central City, 217	8	20-35	10	Major	4	No	0	47
NW Yeon/St.Helens	No	0	No	0	Yes	5	Yes:Central City, Industrial	8	35-38	10	Major	4	Regional	5	32
E Burnside St.	Partial:(I-84E)	8	Yes	5	Yes	5	Yes:Central City, 182nd, Gresham	10	8-17	4	Reg. LRT	5	No	0	37
NE/N Broadway/Weidler(BR.-37th)	Yes:(I-84E)	15	Yes	5	No	0	Yes:Central City, Hollywood	10	25-62	10	Major	4	Minor	2	46
NE Columbia Blvd.	Partial:(I-84E)	10	Yes	5	No	0	Yes:Regional Industrial	8	20-28	8	Minor	2	Regional	5	38
NE Glisan St.	Yes:(I-84)	15	Yes	5	No	0	Yes:Gateway	8	18-37	9	Minor	2	No	0	39
NE Halsey St. (East of 39th)	Yes:(I-84E)	15	Yes	5	No	0	Yes:Hollywood, Gateway	10	10-27	6	Minor	2	Major	4	42
NE Lombard St./Killingsworth	Yes:(I-84E)	12	Yes	5	No	0	Yes:Regional Industrial	8	16-32	8	Major	4	Maj E 60th	4	41
NE MLKing/Grand	Yes:(I-5N)	15	Yes	5	Yes	5	Yes:Central City, Regional Industrial	10	18-26	7	Major	4	Major	4	50
NE Sandy Blvd.(Burnside-I-205)	Yes:(I-84E)	15	Yes-82nd	4	Yes	5	Yes:Central City, Hollywood	10	16-30	8	Major	4	Major	4	50
NE Sandy Blvd.(East of I-205)	Yes:(I-84E)	15	No	0	Yes	5	Yes:Regional Industrial Center	8	13-25	6	Major	4	Major	4	42

Route	Parallel Route to Freeway	Max Points 15	CoP Operation	Max Points 5	Life/ Safety Route	Max Points 5	Connection to Centers Identified in Metro's 2040 Plan	Max Points 10	Traffic Volumes 1,000	Max Points 10	Transit Route	Max Points 5	Truck Route	Max Points 5	Max Total Points 55
NE 33rd Ave.(Sandy-Columbia Blvd.)	No	0	Yes	5	No	0	Yes:Hollywood, Regional Industrial	8	10-23	5	Major	4	Minor	2	24
NE 82nd Ave.	Yes:(I-205)	10	Yes	5	Yes	5	Yes:International Airport	8	16-25	7	Major	4	Major	4	43
NE 102nd Ave.	Yes:(I-205)	12	Yes	5	No	0	Yes:Gateway, Regional Industrial	10	5-23	4	Major	4	Major	4	39
NE 122nd Ave.	Partial:(I-205)	8	Yes	5	No	0	Yes:Regional Industrial	5	15-23	6	Major	4	Major	4	32
SE Division St.	No	0	Yes-162nd	4	No	0	Yes:Gresham	5	25-35	10	Maj to I-205	4	Minor	2	25
SE Foster Rd.	No	0	Yes	5	No	0	Yes:Lents	5	15-28	7	Regional	3	Minor	2	22
SE McLoughlin Blvd.	No	0	Yes	5	Yes	5	Yes:Central City, Milwaukie	8	50-71	10	Minor	5	Regional	5	38
SE Powell Blvd.	Partial:(I-84E)	8	Yes	5	No	0	Yes:Central City, Gresham	8	20-53	10	Minor	2	Major	4	37
SE Stark/Washington (82nd-ECL)	Partial:(I-84E)	10	Yes	5	No	0	Yes: 182nd	5	25-45	10	Major	2	Major	4	36
SE Tacoma St.	No	0	Yes	5	No	0	No	0	10-32	7	Major	4	Minor	2	18
SE/NE 39th Ave. (Woodstock-Sandy)	No	0	Yes	5	No	0	Yes:Hollywood	5	12-22	6	Major	4	Minor	4	24
SE 82nd Ave.	Partial:(I-205)	10	Yes	5	No	0	Yes:Clackamas Town Center	5	20-35	9	Major	4	Major	4	37
SE 122nd Ave.	Partial:(I-205)	8	Yes	5	No	0	No	0	10-26	6	Major	4	Major	4	27
N Columbia Blvd.	Partial:(I-84E)	8	Yes	5	No	0	Yes:Regional Industrial	10	10-25	6	Major	4	Regional	5	38
N Greeley (Interstate Av-Lombard)	No	0	Yes	5	No	0	Yes:Regional Industrial	8	10-27	6	Major	4	No	0	23

Route	Parallel Route to Freeway	Max Points 15	CoP Operation	Max Points 5	Life/ Safety Route	Max Points 5	Connection to Centers Identified in Metro's 2040 Plan	Max Points 10	Traffic Volumes 1,000	Max Points 10	Transit Route	Max Points 5	Truck Route	Max Points 5	Max Total Points 55
N Going St.	No	0	Yes	5	No	0	Yes:Regional Industrial	10	27-38	10	Major	4	Major	4	33
N Interstate Ave.	Yes:(I-5N)	15	Yes	5	No	0	Yes:Central City, Industrial	8	10-15	4	Reg. LRT?	5	Major	4	41
N Lombard St.	Yes:(I-84E)	12	Yes	5	No	0	Yes:St. Johns	5	15-22	6	Major	4	No	0	32

TRAFFIC CALMING PROJECTS LISTS

Active Complex Local Service Streets- Sorted by High Score

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
1	NE	SHAVER ST	122nd to 141st	25	40.00	2615
2	N	SCHMEER RD	Interstate to Whitaker	25	42.00	2774
3	NE	KNOTT ST	15th to 33rd	30	40.00	5581
4	N	DENVER AVE	Lombard St - Interstate Ave	30	38.00	8851
5	NW	WESTOVER RD	25th to Cornell	25	38.00	2366
6	SE	DUKE ST	82nd to 92nd	25	36.00	3743
7	NE	72ND AVE	Killingsworth to Prescott	25	36.00	3782
8	SE	HAWTHORNE BLVD	50th to 60th	25	35.00	4791
9	N	MISSISSIPPI AVE	Skidmore to Interstate	25	36.00	3411
10	SE	135TH AVE	Stark to Division	25	35.00	2146
11	SE	MAIN ST	162nd to 182nd	25	36.00	3215
12	SE	28TH AVE	Holgate to Powell	25	36.00	3002
13	NE	MULTNOMAH ST	15th to 21st	25	33.00	7227
14	NE	FREMONT ST	Vancouver to MLK	25	33.00	9755
15	NE	7TH AVE	Prescott to Alberta	25	36.00	2593
16	SW	VERMONT ST	Bertha to Chestnut	30	37.00	3674
17	SE	52ND AVE	Division to Powell	30	38.00	6558
18	N	WILLAMETTE BLVD	Portland Blvd to Greely	25	40.00	342
19	SE	YAMHILL ST	71st to 82nd	25	35.00	3184
20	SE	26TH AVE	Holgate to Steele	25	36.00	4109
21	NE	60TH AVE	Killingsworth to Prescott	30	39.00	6900
22	NE	KNOTT ST	33rd to 42nd	25	34.00	4903
23	SW	CORBETT AVE	Grover to Hamilton	25	34.00	4733
24	N	ALASKA AVE	Foss to Chautauqua	25	36.00	1576
25	SE	41ST AVE	Holgate to Steele	25	37.00	2125
26	NE	99TH AVE	Glisan to Burnside	25	36.00	2936
27	N	FREMONT ST	Missouri to Vancouver	25	33.00	3876
28	NE	72ND AVE	Prescott to Sandy	25	35.00	2678
29	SE	130TH AVE	Powell to Holgate	25	36.00	1845
30	SW	VIRGINIA ST	Pendleton to Taylors Ferry Rd	25	35.00	2093
31	N	WOOLSEY AVE	Lombard to Willamette	25	35.00	2228
32	N	GREELEY AVE	Lombard to Portland	35	38.00	7380
33	NE	67/68TH AVE	Halsey to Glisan	25	35.00	3973
34	SE	MILL ST	130th to 139th	25	34.00	2434
35	N	WALL AVE	Lombard to Willamette	25	36.00	1295
36	N	ALBERTA ST	Interstate to Vancouver	30	35.00	9897
37	NE	15TH AVE	Lombard to Dekum	25	35.00	1912
38	SW	BARNES RD	Burnsideto Skyline	25	36.00	2289
39	NW	19TH AVE	Lovejoy to Burnside	25	30.00	5784
40	SE	ELLIS ST	Foster to 92nd	30	38.00	2853
41	NE	AINSWORTH ST	15th to 33rd	30	37.00	5868
42	NE	60TH AVE	Lombard to Killingsworth	25	34.00	4491
43	SE	62ND AVE	Duke to Flavel	25	37.00	618
44	SE	BUSH ST	103rd Ave to 112th Ave	25	36.00	1136
45	SW	PALATINE HILL RD	Boones to Palater	25	36.00	1062
46	N	ALBINA AVE	Killingsworth to Skidmore	30	35.00	5318
47	NE	MORRIS ST	111th dr to 117th	25	37.00	765
48	SE	42ND AVE	Powell Blvd to Holgate Blvd	25	34.00	2428
49	SE	LINCOLN ST	39th to 50th	25	35.00	1878
50	SE	LINCOLN ST	50th to 60th	25	33.00	2785

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
51	NE	139TH AVE	Glisan to Burnside	25	35.00	1851
52	NE	PEERLESS PL	Sandy to Royal Ct	25	31.00	6246
53	SE	21ST AVE	Division to Powell	30	33.00	4560
54	NE	114TH AVE	Halsey to Glisan	25	36.00	1316
55	SE	13TH AVE	Tacoma to Ochoco	30	32.00	4304
56	SW	62ND AVE	Kruse Ridge to Lesser	25	34.00	2809
57	SE	32ND AVE	Johnson Creek to Sherrett	25	28.00	5846
58	N	MARYLAND AVE	Going to Interstate	25	29.00	5509
59	SW	30TH AVE	Hume to Spring Garden	25	32.00	3878
60	N	MIDWAY AVE	Columbia to Fessenden	25	33.00	2516
61	SW	WHITAKER ST	Corbett to Hood	25	21.00	5956
62	SW	NEBRASKA ST	Macadam to Corbett	25	33.00	2400
63	NE	MORRIS CT	127th TO 132nd	25	34.00	1874
64	SW	6TH DR/BANCROFT	Gaines to Terwilliger	25	31.00	3316
65	N	WILLAMETTE BLVD	St. Louis to Richmond	25	32.00	2771
66	NE	REGENTS DR	24th to Alameda	25	35.00	1068
67	NE	6TH DR	Vancouver Way to Marine	40	47.00	2488
68	NW	SKYLINE BLVD	Thompson to Springville	40	48.00	1978
69	SE	22ND/23RD AVE	Bybee to Nehalem	25	32.00	2417
70	SW	ORCHARD HILL RD	Boones Ferry to Orchard Hill Ln	25	35.00	902
71	N	HALLECK ST	Peninsular to Delaware	25	33.00	1901
72	SW	SPRING GARDEN CT	35th to Dolph	25	36.00	336
73	SE	20TH AVE	Hawthorne to Division	30	35.00	3286
74	SE	YAMHILL ST	82nd to 92nd	25	34.00	1261
75	SW	MAIN ST	King to Vista	25	27.00	3218
76	N	MICHIGAN AVE	Ainsworth to Portland Blvd	25	35.00	673
77	SW	31ST AVE	Multnomah to Hume	25	27.00	3172
78	SE	FRANCIS ST	26th to 39th	25	33.00	1664
79	NE	74TH AVE	Halsey to Glisan	25	33.00	1624
80	SW	COUNCIL CREST DR	Greenway to Fairmount	25	34.00	1070
81	NW	SKYLINE BLVD	Germantown to Springville	40	48.00	1551
82	SE	MILL ST	82nd to 92nd	25	33.00	1487
83	SW	52ND AVE	Vermont to Custer	25	34.00	969
84	SE	62ND AVE	Division to Powell	25	33.00	1430
85	SE	HARNEY ST	72nd to 82nd	25	35.00	420
86	SW	16TH AVE	Davenport to College	25	32.00	1918
87	SE	CRYSTAL SPRINGS BLVD	39thto 45th	25	31.00	2394
88	SE	OGDEN ST	60th to 52nd	25	35.00	374
89	NE	HOYT ST	52nd to 58th	25	25.00	2868
90	NE	SIMPSON ST	42nd to Lombard	25	34.00	860
91	NE	155TH	Halsey to Glisan	25	35.00	345
92	SE	105TH AVE	Mt. Scott Blvd to Knapp	25	35.00	337
93	N	OSWEGO AVE	Columbia to Fessenden	25	33.00	1317
94	SE	RAYMOND ST	122nd to 133rd	25	35.00	314
95	NE	KLICKITAT ST	I-84 to 111th Dr	25	35.00	305
96	SE	CRYSTAL SPRINGS BLVDD	89th to 92nd	25	34.00	800
97	SE	90TH PL	Powell to Division	25	35.00	276
98	SE	HARRISON ST	32nd Pl to 39th	25	34.00	754
99	SE	26TH AVE	Hawthorne to Division	25	29.00	2745
100	SE	LEXINGTON ST	Flavel Dr to 62nd	25	35.00	243
101	SE	RAMONA ST	128th to 136th	25	34.00	736
102	SE	106TH AVE	Stark to Cherry Blossom	25	30.00	2720
103	NE	KNOTT ST	102nd to 111th Dr	25	34.00	683

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
104	N	WOOLSEY CT	Woolsey TO Fessenden	25	32.00	1671
105	NE	27TH AVE	Dekum to Killingsworth	25	32.00	1670
106	SW	DOLPH CT	Capitol Hwy to 30th Ave	25	34.00	654
107	SE	51ST AVE	Belmont to Division	25	34.00	595
108	SE	OGDEN ST	72nd Ave to 82nd Ave	25	34.00	588
109	SW	HAMILTON TERR	Terwilliger to Barbur	25	31.00	2078
110	NE	74TH AVE	Glisan to Burnside	25	33.00	1064
111	SE	ELLIOTT AVE	Hawthorne to Division	25	33.00	1047
112	NE	39TH AVE	Tillamook to Knott	25	33.00	1044
113	SW	CHESTNUT ST	10th to Terwilliger	30	30.00	2530
114	SE	ALDER ST	148th to 162nd Avenues	25	34.00	513
115	NE	118 TH AVE	Halsey to Glisan	25	34.00	511
116	SW	17TH AVE	Taylors Ferry Rd to Spring Garden	25	33.00	1003
117	SE	158TH AVE	Division to Harrison	25	34.00	494
118	SE	80TH AVE	Powell Blvd to Holgate Blvd	25	33.00	974
119	SW	1ST/GROVER	Arthur to Corbett	25	30.00	2474
120	SE	153RD AVE	Division to Powell	25	34.00	461
121	SW	7TH AVE	Chestnut to Terwilliger	25	29.00	2459
122	N	CHARLESTON AVE	Fessenden to Lombard	25	33.00	948
123	SW	17TH DR	Capital Hill Rd to Barbur	25	34.00	447
124	NW	MACLEAY BLVD	Warrenton to Burnside	25	33.00	925
125	SW	BOUNDARY ST	Shattuck to 65th	25	34.00	417
126	NE	27TH AVE	Dekum to Lombard	25	31.00	1914
127	NE	FARGO CT	117th to 122nd	25	34.00	396
128	SE	TENINO ST	72nd to Flavel	25	33.00	894
129	SW	SAINT CLAIRE AVE	Park Pl. to Burnside	25	28.00	2391
130	SE	LINCOLN ST	117th to 122nd	25	33.00	890
131	N	DETROIT AVE	Portland to Killingsworth	25	34.00	382
132	NW	SKYLINE BLVD	Newberry to Germantown	40	49.00	353
133	SW	MADISON ST	Murray to Vista	25	30.00	2344
134	NE	53RD AVE	Glisan to Burnside	25	31.00	1839
135	SW	MILES ST	Barbur to Brier	25	26.00	2327
136	SE	89TH AVE	Taylor to Division	25	33.00	805
137	SW	16TH AVE	Montgomery to Broadway	25	31.00	1775
138	NE	FREMONT DR	Fremont St to Russell St	25	31.00	1747
139	SE	62ND AVE	Flavel to Clatsop	25	33.00	745
140	NE	MASON ST	Cully to 72nd	25	34.00	243
141	SE	55TH AVE	Woodward St to Powell Blvd	25	33.00	718
142	SE	157TH AVE	Division to Powell	25	33.00	669
143	SW	BANCROFT ST	Macadam to River	25	24.00	2145
144	SW	ILLINOIS ST	Shattuck to 45th	25	33.00	639
145	NE	STANTON ST	154th Ave to 162nd Ave	25	33.00	631
146	SE	102ND AVE	Harold to Foster	25	33.00	617
147	NE	SENATE ST	39th to 44th Ave	25	33.00	602
148	SE	73RD AVE	Powell Blvd to Holgate Blvd	25	33.00	569
149	SW	DAVENPORT ST	Broadway Dr. to Tangent St	25	33.00	550
150	NE	60TH AVE	Sandy to Halsey	25	31.00	1548
151	SW	13TH DR	12th to Bertha	25	33.00	541
152	NE	EMERSON ST	Cully to 72nd	25	33.00	537
153	SW	NEVADA CT	52nd to 60th	25	33.00	497
154	N	OSWEGO AVE	Lombard to Fessenden	25	32.00	980
155	NE	37TH AVE	Fremont to Broadway	25	31.00	1479
156	NE	37TH AVE	Knott to Morris	25	31.00	1478
157	NE	HASSALO ST	39th Ave to Senate St	25	33.00	471
158	SE	141 ST AVE	Division to Powell	25	33.00	469

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
159	NE	109TH AVE	Halsey to Oregon	25	33.00	455
160	SE	20TH AVE	Clinton to Powell	25	27.00	1935
161	NE	70TH AVE	Halsey to Glisan	25	33.00	433
162	SE	141ST AVE	Stark to Main	25	33.00	433
163	SE	34 TH AVE	Belmont St to Hawthorne St	25	28.00	1910
164	SE	BUSH ST	112th to 122nd	25	32.00	902
165	SE	45TH AVE	Woodstock to Glenwood	25	33.00	372
166	SE	130TH AVE	Division to Dead End	25	33.00	369
167	NE	60TH AVE	Woodstock to Duke	25	30.00	1866
168	NE	119TH AVE	San Rafael to Halsey	25	33.00	364
169	NE	KLICKITAT ST	111th dr to 117th	25	33.00	356
170	SE	34TH AVE	Belmont to Stark	25	32.00	851
171	SE	146TH AVE	Main to Stark	25	32.00	849
172	SW	25TH AVE	Lancaster to dead end	25	33.00	345
173	SE	64TH AVE	Flavel St to Duke St	25	33.00	343
174	NE	SACRAMENTO ST	52nd to 57th	25	31.00	1338
175	NE	ALAMEDA ST	Fremont to 41st	25	26.00	1836
176	SE	30TH AVE	Lincoln to Division	25	29.00	1819
177	SE	113TH AVE	Powell Ct to Holgate Blvd	25	33.00	318
178	SE	GLENWOOD ST	39th to 45th	25	31.00	1314
179	SE	34TH AVE	Hawthorne to Division	25	30.00	1806
180	SE	60TH AVE	Foster Rd to Holgate Blvd	25	26.00	1791
181	SE	19TH AVE	Bybee TO Tacoma	25	33.00	276
182	NE	SCHILLER ST	30th to 39th Ave	25	33.00	273
183	SE	61ST AVE	Foster to Holgate	25	26.00	1757
184	SE	33RD AVE	Division to Powell	25	27.00	1757
185	N	FOSS AVE	Houghton to Willis	25	33.00	222
186	NE	BRAZEE ST	82nd to 92nd	25	32.00	720
187	SE	97TH AVE	Holgate to Harold	25	32.00	713
188	SW	36TH AVE	Dolph to Alice	25	33.00	179
189	NE	STANTON ST	MLK to 15th	25	32.00	660
190	N	WASHBURNE AVE	Willis to Lombard	25	32.00	649
191	SE	MITCHELL ST	52nd to 72nd	25	32.00	648
192	SE	62ND AVE	Powell to Foster	25	31.00	1136
193	N	TYLER ST	Willamette to Lombard	25	32.00	626
194	SE	53RD AVE	Stark to Belmont	25	31.00	1114
195	SE	48TH AVE	Woodstock to Henderson	25	32.00	613
196	N	SKIDMORE ST	Interstate Ave to Overlook Blvd	25	31.00	1106
197	NE	6TH AVE	Ainsworth to Dekum	25	31.00	1098
198	SE	28TH PL	Powell to Holgate	25	32.00	582
199	SE	REX ST	27th to 39th	25	31.00	1078
200	NE	67TH AVE	Tillamook to Halsey	28	28.00	1570
201	NE	HASSALO ST	82nd to 91st	25	31.00	1049
202	NE	FREMONT CT	112th to 116th	25	32.00	541
203	SE	170TH AVE	Division to Haig	25	32.00	535
204	SE	170TH AVE	Stephens to Division	25	32.00	535
205	NE	SAN RAFAEL ST	148th to 162nd	25	31.00	1029
206	N	SWENSON ST	Oswego Ave to Iris Way	25	32.00	527
207	NE	67TH AVE	Glisan to Burnside	25	28.00	1506
208	N	BUCHANAN AVE	Lombard to Willamette	25	31.00	997
209	SE	79TH AVE	Division to Powell	25	32.00	491
210	SW	18TH DR	Sunset Blvd. to B-H Hwy.	25	31.00	980
211	SW	BERTHA BLVD	B-H Hwy. to 30th	25	32.00	478
212	SW	MONTGOMERY ST	14th to Vista	25	29.00	1476
213	SE	MARKET ST	162nd to 172nd	25	32.00	461

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
214	SE	MADISON ST	122nd Ave to 129th Ave	25	32.00	460
215	NE	HANCOCK ST	15th to 33rd	25	26.00	1454
216	NE	WYGANT ST	Cully Blvd to 72nd Ave	25	32.00	446
217	NE	160TH AVE	Halsey to Glisan	25	32.00	444
218	SW	TUNNELWOOD ST	Dosch to 45th	25	32.00	442
219	SE	116TH AVE	Holgate Blvd to Bush St	25	32.00	432
220	SE	OGDEN ST	39th to 45th Ave	25	32.00	429
221	SE	101ST AVE	Division to Market	25	31.00	925
222	SE	HENDERSON ST	39th to 52nd	25	32.00	417
223	SE	76TH AVE	Powell Blvd to Holgate Blvd	25	32.00	409
224	SE	FRANKLIN ST	McLoughlin to Milwaukie	25	24.00	1393
225	NE	STANTON ST	117th to 122nd	25	31.00	876
226	SW	34TH AVE	Falcon to Hume	25	29.00	1376
227	NE	112TH AVE	Halsey to Oregon	25	32.00	356
228	NE	6TH AVE	Lombard to Ainsworth	25	31.00	847
229	NE	WYGANT ST	95th to 102nd	25	31.00	845
230	SE	LINN ST	17th to River	25	30.00	1323
231	SE	WOODWARD ST	39th to 46th	25	31.00	808
232	NE	24TH AVE	Fremont to Ridgewood Dr	25	27.00	1301
233	SE	45TH AVE	Burnside to Stark	25	32.00	277
234	NE	48TH AVE	Killingsworth to Alberta	25	32.00	276
235	SE	60TH AVE	Holgate to Woodstock	25	31.00	757
236	SW	MAPLECREST CT	Maplecrest dr. to Maplecrest dr.	25	32.00	252
237	N	STANTON ST	Williams to MLK	25	30.00	1249
238	SW	50TH AVE	Vermont to Iowa	25	31.00	748
239	NE	SUMNER ST	42nd TO 48th	25	32.00	243
240	N	DELAWARE AVE	Hunt to Lombard	25	31.00	734
241	SE	MAIN ST	34th to 39th	25	24.00	1229
242	NE	55TH AVE	Glisan to Burnside	25	31.00	719
243	SE	SALMON ST	30th to 39th	25	30.00	1217
244	N	BUCHANAN AVE	Columbia to Fessenden	25	31.00	712
245	N	ST JOHNS AVE	Lombard St to Seneca St	25	31.00	711
246	SE	EVERGREEN ST	39th to 45th	25	31.00	710
247	NE	105TH AVE	Prescott to Fremont	25	29.00	1205
248	SE	75TH AVE	Division to Powell	25	31.00	692
249	SE	30TH AVE	Holgate to Steele	25	28.00	1191
250	SE	WOODWARD ST	62nd to 71st	25	31.00	676
251	SE	97TH AVE	Harold to Foster	25	30.00	1164
252	SE	91ST AVE	Powell to Holgate	25	31.00	661
253	NE	HANCOCK ST	MLK to Williams	25	28.00	1157
254	N	MICHIGAN AVE	Killingsworth to Skidmore	25	27.00	1150
255	SE	KNAPP ST	27th to 39th	25	28.00	1145
256	SW	MITCHELL ST	Corbett to Macadam	25	23.00	1144
257	SE	25TH AVE	Gladstone to Holgate	25	29.00	1133
258	NE	37TH AVE	Portland to Killingsworth	25	30.00	1132
259	NE	19TH AVE	Prescott to Fremont	25	31.00	615
260	SE	17TH AVE	Division to Powell	25	28.00	1115
261	NW	CUMBERLAND RD	End to Westover	25	30.00	1110
262	NE	ALAMEDA ST	41st to 57th	25	30.00	1104
263	NE	11TH AVE	Fremont to Broadway	25	31.00	600
264	N	ARGYLE ST	Peninsular to Argyle Way	25	30.00	1100
265	SE	32ND AVE	Ankeny to Stark	25	30.00	1074
266	SE	65TH AVE	Powell Blvd to Clinton St	25	31.00	569
267	NE	SKIDMORE ST	42nd to Cully	25	31.00	566
268	SE	99TH AVE	Powell to Holgate	25	30.00	1061

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
269	SW	51ST AVE	Multnomah to Miles	25	31.00	559
270	SW	CANBY ST	Olsen (Wash Co. line) to 59th	25	31.00	556
271	SW	CANBY ST	Canby Ln to 59th	25	31.00	556
272	N	GILBERT AVE	Smith to Lombard	25	31.00	550
273	SE	152ND AVE	Mill to Division	25	31.00	549
274	SE	45TH AVE	Division to Hawthorne	25	31.00	549
275	NW	27TH AVE	Vaughn to Thurman	25	21.00	1028
276	NE	24TH AVE	Glisan to Burnside	25	30.00	1023
277	SW	VACUNA ST	49th to 35th	25	31.00	522
278	SE	34TH AVE	Powell to Holgate	25	31.00	519
279	NE	GOING ST	Williams to MLK	25	24.00	1014
280	SE	34TH AVE	Division to Woodward	25	30.00	1014
281	SE	NAEGELI DR	Powell to Lillian Way	25	31.00	514
282	SE	SALMON ST	122nd to 130th	25	31.00	513
283	NE	104TH AVE	Hancock to Weidler	25	29.00	1008
284	SE	SPOKANE ST	River to 13th	25	29.00	997
285	NE	108TH AVE	Burnside to Glisan	25	31.00	497
286	NE	71ST AVE	Halsey to Glisan	25	31.00	496
287	SE	KNAPP ST	39th TO 45th	25	31.00	496
288	SE	33RD AVE	Powell to Cora	25	28.00	983
289	SE	RAMONA ST	39th to 52nd	25	28.00	981
290	SE	37TH AVE	Division to Hawthorne	25	30.00	981
291	SE	80TH AVE	Washington to Division	25	29.00	979
292	SE	BROOKLYN ST	82nd to 89th Ave	25	31.00	457
293	N	COOK ST	Williams to MLK	25	29.00	955
294	SE	MARKET ST	74th to 82nd	25	31.00	453
295	SW	MILES ST	Capitol to 25th	25	31.00	453
296	SW	IDAHO ST	Corbett to Macadam	25	31.00	453
297	SE	79 TH AVE	Powell Blvd to Holgate Blvd	25	31.00	450
298	SE	37TH AVE	Powell Blvd to Holgate Blvd	25	30.00	947
299	SE	REX ST	103rd to 107th Ave	25	31.00	440
300	N	IVANHOE ST	Reno to St Louis	25	30.00	938

Streamline Streets- Sorted Only by High Score

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
1	NW	WESTOVER RD	25th To Cornell	25	38	2366
2	SE	41ST AVE	Holgate To Steele	25	37	2125
3	N	WALL AVE	Lombard To Willamette	25	36	1295
4	N	ALASKA AVE	Foss To Chautauqua	25	36	1576
5	SW	BARNES RD	Burnside To Skyline	25	36	2289
6	N	WOOLSEY AVE	Lombard To Willamette	25	35	2228
7	NE	114TH AVE	Halsey To Glisan	25	36	1316
8	SE	130TH AVE	Powell To Holgate	25	36	1845
9	SE	135TH AVE	Stark To Division	25	35	2146
10	SE	LINCOLN ST	39th To 50th	25	35	1878
11	SW	VIRGINIA ST	Pendleton To Taylors Ferry Rd	25	35	2093
12	SE	BUSH ST	103rd Ave To 112th Ave	25	36	1136
13	NE	REGENTS DR	24th To Alameda	25	35	1068
14	SW	PALATINE HILL RD	Boones To Palater	25	36	1062
15	NE	MORRIS CT	127th To 132nd	25	34	1874
16	SE	YAMHILL ST	82nd To 92nd	25	34	1261
17	NE	139TH AVE	Glisan To Burnside	25	35	1851
18	SE	42ND AVE	Powell Blvd To Holgate Blvd	25	34	2428
19	SE	122ND AVE	Foster To Flavel	25	35	1599
20	NE	MORRIS ST	111th Dr To 117th	25	37	765
21	SE	62ND AVE	Duke To Flavel	25	37	618
22	N	OSWEGO AVE	Columbia To Fessenden	25	33	1317
23	N	HALLECK ST	Peninsular To Delaware	25	33	1901
24	SE	62ND AVE	Division To Powell	25	33	1430
25	SW	ORCHARD HILL RD	Boones Ferry To Orchard Hill Ln	25	35	902
26	N	MICHIGAN AVE	Ainsworth To Portland Blvd	25	35	673
27	SW	COUNCIL CREST DR	Greenway To Fairmount	25	34	1070
28	SE	ELLIOTT AVE	Hawthorne To Division	25	33	1047
29	NE	39TH AVE	Tillamook To Knott	25	33	1044
30	SW	16TH AVE	Davenport To College	25	32	1918
31	SE	MILL ST	82nd To 92nd	25	33	1487
32	NE	27TH AVE	Dekum To Killingsworth	25	32	1670
33	N	WOOLSEY CT	Woolsey To Fessenden	25	32	1671
34	SE	80TH AVE	Powell Blvd To Holgate Blvd	25	33	974
35	SW	52ND AVE	Vermont To Custer	25	34	969
36	SE	HARRISON ST	32nd Pl To 39th	25	34	754
37	N	CHARLESTON AVE	Fessenden To Lombard	25	33	948
38	NE	SIMPSON ST	42nd To Lombard	25	34	860
39	NE	53RD AVE	Glisan To Burnside	25	31	1839
40	NE	37TH AVE	Knott To Morris	25	31	1478
41	NE	SACRAMENTO ST	52nd To 57th	25	31	1338

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
42	SE	CRYSTAL SPRINGS BLVDD	89th To 92nd	25	34	800
43	SE	22ND/23RD AVE	Bybee To Nehalem	25	32	2417
44	NE	60TH AVE	Sandy To Halsey	25	31	1548
45	N	OSWEGO AVE	Lombard To Fessenden	25	32	980
46	SE	RAMONA ST	128th To 136th	25	34	736
47	SE	62ND AVE	Powell To Foster	25	31	1136
48	SE	55TH AVE	Woodward St To Powell Blvd	25	33	718
49	SE	53RD AVE	Stark To Belmont	25	31	1114
50	NE	6TH AVE	Ainsworth To Dekum	25	31	1098
51	SE	TENINO ST	72nd To Flavel	25	33	894
52	SE	LINCOLN ST	117th To 122nd	25	33	890
53	NE	KNOTT ST	102nd To 111th Dr	25	34	683
54	SE	REX ST	27th To 39th	25	31	1078
55	SW	DOLPH CT	Capitol Hwy To 30th Ave	25	34	654
56	SE	34TH AVE	Belmont To Stark	25	32	851
57	SE	HARNEY ST	72nd To 82nd	25	35	420
58	SE	102ND AVE	Harold To Foster	25	33	617
59	SE	89TH AVE	Taylor To Division	25	33	805
60	NE	SENATE ST	39th To 44th Ave	25	33	602
61	SE	GLENWOOD ST	39th To 45th	25	31	1314
62	NE	37TH AVE	Fremont To Broadway	25	31	1479
63	NE	27TH AVE	Dekum To Lombard	25	31	1914
64	SW	16TH AVE	Montgomery To Broadway	25	31	1775
65	SW	1ST/GROVER	Arthur To Corbett	25	30	2474
66	NE	FREMONT DR	Fremont St To Russell St	25	31	1747
67	N	STANTON ST	Williams To Mlk	25	30	1249
68	SW	HAMILTON TERR	Terwilliger To Barbur	25	31	2078
69	SE	SALMON ST	30th To 39th	25	30	1217
70	SE	34TH AVE	Hawthorne To Division	25	30	1806
71	N	BUCHANAN AVE	Lombard To Willamette	25	31	997
72	SE	51ST AVE	Belmont To Division	25	34	595
73	SE	OGDEN ST	72nd Ave To 82nd Ave	25	34	588
74	SE	73RD AVE	Powell Blvd To Holgate Blvd	25	33	569
75	SE	97TH AVE	Harold To Foster	25	30	1164
76	SW	DAVENPORT ST	Broadway Dr. To Tangent St	25	33	550
77	SE	62ND AVE	Flavel To Clatsop	25	33	745
78	SE	ALDER ST	148th To 162nd Avenues	25	34	513
79	SE	97TH AVE	Holgate To Harold	25	32	713
80	NE	118 TH AVE	Halsey To Glisan	25	34	511
81	N	SKIDMORE ST	Interstate Ave To Overlook Blvd	25	31	1106
82	NE	ALAMEDA ST	41st To 57th	25	30	1104
83	SE	BUSH ST	112th To 122nd	25	32	902
84	N	ARGYLE ST	Peninsular To Argyle Way	25	30	1100
85	SE	158TH AVE	Division To Harrison	25	34	494

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
86	SE	32ND AVE	Ankeny To Stark	25	30	1074
87	NE	HASSALO ST	39th Ave To Senate St	25	33	471
88	SE	157TH AVE	Division To Powell	25	33	669
89	SE	153RD AVE	Division To Powell	25	34	461
90	NE	STANTON ST	MLK To 15th	25	32	660
91	N	WASHBURNE AVE	Willis To Lombard	25	32	649
92	NE	HASSALO ST	82nd To 91st	25	31	1049
93	SE	146TH AVE	Main To Stark	25	32	849
94	NE	6TH AVE	Lombard To Ainsworth	25	31	847
95	SW	17TH DR	Capital Hill Rd To Barbur	25	34	447
96	SW	ILLINOIS ST	Shattuck To 45th	25	33	639
97	NE	70TH AVE	Halsey To Glisan	25	33	433
98	NE	STANTON ST	154th Ave To 162nd Ave	25	33	631
99	N	TYLER ST	Willamette To Lombard	25	32	626
100	SW	BOUNDARY ST	Shattuck To 65th	25	34	417
101	SE	34TH AVE	Division To Woodward	25	30	1014
102	SE	WOODWARD ST	39th To 46th	25	31	808
103	SE	LINN ST	17th To River	25	30	1323
104	NE	60TH AVE	Woodstock To Duke	25	30	1866
105	SW	MADISON ST	Murray To Vista	25	30	2344
106	SE	28TH PL	Powell To Holgate	25	32	582
107	SE	37TH AVE	Division To Hawthorne	25	30	981
108	SW	18TH DR	Sunset Blvd. To Bh Hwy.	25	31	980
109	SE	37TH AVE	Powell Blvd To Holgate Blvd	25	30	947
110	SW	13TH DR	12th To Bertha	25	33	541
111	N	IVANHOE ST	Reno To St Louis	25	30	938
112	NE	EMERSON ST	Cully To 72nd	25	33	537
113	N	DELAWARE AVE	Hunt To Lombard	25	31	734
114	NE	37TH AVE	Portland To Killingsworth	25	30	1132
115	N	SWENSON ST	Oswego Ave To Iris Way	25	32	527
116	SE	101ST AVE	Division To Market	25	31	925
117	NE	BRAZEE ST	82nd To 92nd	25	32	720
118	NE	55TH AVE	Glisan To Burnside	25	31	719
119	N	ST JOHNS AVE	Lombard St To Seneca St	25	31	711
120	SE	EVERGREEN ST	39th To 45th	25	31	710
121	NW	CUMBERLAND RD	End To Westover	25	30	1110
122	SW	NEVADA CT	52nd To 60th	25	33	497
123	SE	75TH AVE	Division To Powell	25	31	692
124	SE	79TH AVE	Division To Powell	25	32	491
125	NE	STANTON ST	117th To 122nd	25	31	876
126	SE	141 ST AVE	Division To Powell	25	33	469
127	N	WINCHELL ST	Newman To Chautauqua	25	30	864
128	SE	99TH AVE	Powell To Holgate	25	30	1061
129	NE	109TH AVE	Halsey To Oregon	25	33	455
130	SE	MITCHELL ST	52nd To 72nd	25	32	648
131	NE	WYGANT ST	95th To 102nd	25	31	845
132	SE	141ST AVE	Stark To Main	25	33	433

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
133	SE	OGDEN ST	39th To 45th Ave	25	32	429
134	NE	24TH AVE	Glisan To Burnside	25	30	1023
135	SE	79TH AVE	Holgate To Foster	25	30	816
136	NE	19TH AVE	Prescott To Fremont	25	31	615
137	SE	48TH AVE	Woodstock To Henderson	25	32	613
138	NE	SENECA ST	St. Johns Ave To St. Louis Ave	25	30	813
139	SE	76TH AVE	Powell Blvd To Holgate Blvd	25	32	409
140	NE	ALAMEDA ST	57th To 68th	25	30	807
141	SE	10TH AVE	Powell To Cora	25	30	805
142	NE	11TH AVE	Fremont To Broadway	25	31	600
143	NE	HOLLAND ST	Vancouver To Mlk Blvd	25	30	780
144	SE	65TH AVE	Powell Blvd To Clinton St	25	31	569
145	SE	SALMON ST	20th To 30th	25	30	761
146	SE	53RD AVE	Burnside To Stark	25	30	760
147	SE	60TH AVE	Holgate To Woodstock	25	31	757
148	SE	45TH AVE	Division To Hawthorne	25	31	549
149	SW	50TH AVE	Vermont To Iowa	25	31	748
150	SE	ANKENY ST	28th To 39th	25	30	747
151	NE	FREMONT CT	112th To 116th	25	32	541
152	SE	170TH AVE	Division To Haig	25	32	535
153	SE	170TH AVE	Stephens To Division	25	32	535
154	SW	60TH AVE	Vermont To Multnomah	25	30	930
155	NW	MACLEAY BLVD	Burnside To Alpine Ter	25	30	925
156	SE	SALMON ST	122nd To 130th	25	31	513
157	N	BUCHANAN AVE	Columbia To Fessenden	25	31	712
158	SW	GREENLEAF DR	Patton To End(Greenleaf)	25	30	897
159	SE	KNAPP ST	39th To 45th	25	31	496
160	SW	BURLINGAME AVE	Capitol Hwy To Barbur	25	30	896
161	SE	58TH AVE	Holgate To Mitchell	25	30	687
162	SW	BERTHA BLVD	B-H Highway To 30th	25	32	478
163	SE	WOODWARD ST	62nd To 71st	25	31	676
164	N	WESTANNA AVE	Lombard To Willamette	25	30	675
165	SE	91ST AVE	Powell To Holgate	25	31	661
166	SE	MARKET ST	162nd To 172nd	25	32	461
167	SE	MADISON ST	122nd Ave To 129th Ave	25	32	460
168	SW	IDAHO ST	Corbett To Macadam	25	31	453
169	SE	TAYLOR ST	12th To 20th Ave	25	30	650
170	NE	WYGANT ST	Cully Blvd To 72nd Ave	25	32	446
171	NE	160TH AVE	Halsey To Glisan	25	32	444
172	SE	46TH AVE	Stark To Belmont	25	30	843
173	SW	TUNNELWOOD ST	Dosch To 45th	25	32	442
174	N	SHAVER ST	Interstate To Overlook	25	30	639
175	NE	MORGAN ST	15th To 22nd	25	31	434
176	N	RUSSET ST	Lombard To Chatauqua	25	30	834
177	N	MCKENNA AVE	Willamette To Lombard	25	31	433
178	SE	116TH AVE	Holgate Blvd To Bush St	25	32	432

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
179	SE	54TH AVE	Hawthorne To Division	25	31	427
180	SE	61ST AVE	Burnside To Stark	25	31	421
181	SE	HENDERSON ST	39th To 52nd	25	32	417
182	SE	46TH AVE	Division To Hawthorne	25	31	416
183	SE	62ND AVE	Burnside To Stark	25	30	615
184	N	SENECA ST	St. Johns Ave To St. Louis	25	30	813
185	N	CENTRAL ST	Bruce To St Louis	25	30	610
186	N	JUNEAU ST	Chautauqua Pl To Chautauqua Blvd	25	30	598
187	N	EDISON ST	Reno To Philadelphia	25	30	593
188	SE	45TH AVE	Steele To Woodstock	25	30	588
189	N	MONROE ST	Mlk Blvd To Williams	25	30	578
190	SE	OGDEN ST	62nd To 72nd	25	30	774
191	NE	SKIDMORE ST	42nd To Cully	25	31	566
192	NE	JARRETT ST	MLK Blvd To 15th Ave	25	30	566
193	SW	51ST AVE	Multnomah To Miles	25	31	559
194	SW	CANBY ST	Olsen (Wash Co. Line) To 59th	25	31	556
195	SW	CANBY ST	Canby Ln To 59th	25	31	556
196	N	GILBERT AVE	Smith To Lombard	25	31	550
197	SE	152ND AVE	Mill To Division	25	31	549
198	N	COMMERCIAL AVE	Portland To Killingsworth	25	30	543
199	NE	BEECH ST	42nd To 47th	25	30	538
200	SW	VACUNA ST	49th To 35th	25	31	522
201	NE	8TH AVE	Dekum To Ainsworth	25	30	519
202	SE	NAEGELI DR	Powell To Lillian Way	25	31	514
203	NE	13TH AVE	Ainsworth To Dekum	25	30	512
204	NE	108TH AVE	Burnside To Glisan	25	31	497
205	NE	71ST AVE	Halsey To Glisan	25	31	496
206	SE	87TH AVE	Flavel To Duke	25	30	467
207	SE	BROOKLYN ST	82nd To 89th Ave	25	31	457
208	SE	168TH/169TH AVE	Stark To Main	25	30	656
209	SW	MILES ST	Capitol To 25th	25	31	453
210	SE	MARKET ST	74th To 82nd	25	31	453
211	N	MONTANA AVE	Skidmore To Failing	25	30	450
212	SE	79 TH AVE	Powell Blvd To Holgate Blvd	25	31	450
213	SE	REX ST	103rd To 107th Ave	25	31	440
214	NE	58TH AVE	Glisan To Burnside	25	30	438
215	N	TRENTON ST	Chautauqua To Curtis	25	30	431
216	SE	KNAPP ST	45th To 52nd	25	31	428
217	SE	CARLTON ST	28th To 32nd	25	30	417
218	N	WILLAMETTE BLVD	Greely To Interstate	25	30	416
219	SE	RURAL ST	45th To 52nd	25	30	573
220	NE	114TH AVE	San Rafael To Glisan	25	30	572
221	N	HAIGHT AVE	Portland To Killingsworth	25	30	552
222	SE	78 TH AVE	Flavel St To Duke St	25	30	550

Rank	Dir	Street	Segment	Posted	85% Speed	Volume
223	NE	78TH AVE	Burnside To Glisan	25	30	530
224	SE	HARRISON ST	Mill To 159th	25	30	511
225	NE	72ND AVE	Halsey To Glisan	25	30	489
226	SW	ALICE ST	Capitol Hwy To Barbur Bl	25	30	446
227	SW	8TH AVE	Dolph To Plum Dr	25	30	426
228	SW	8TH AVE	Dolph To Lucille	25	30	426
229	SE	97TH AVE	Burnside To Stark	25	30	415
230	SW	NEBRASKA ST	Mcadam To Corbett	25	33	2400
231	SE	34TH AVE	Powell To Holgate	25	31	519
232	NW	MACLEAY BLVD	Warrenton To Burnside	25	33	925

SOUTHWEST URBAN TRAILS MAP

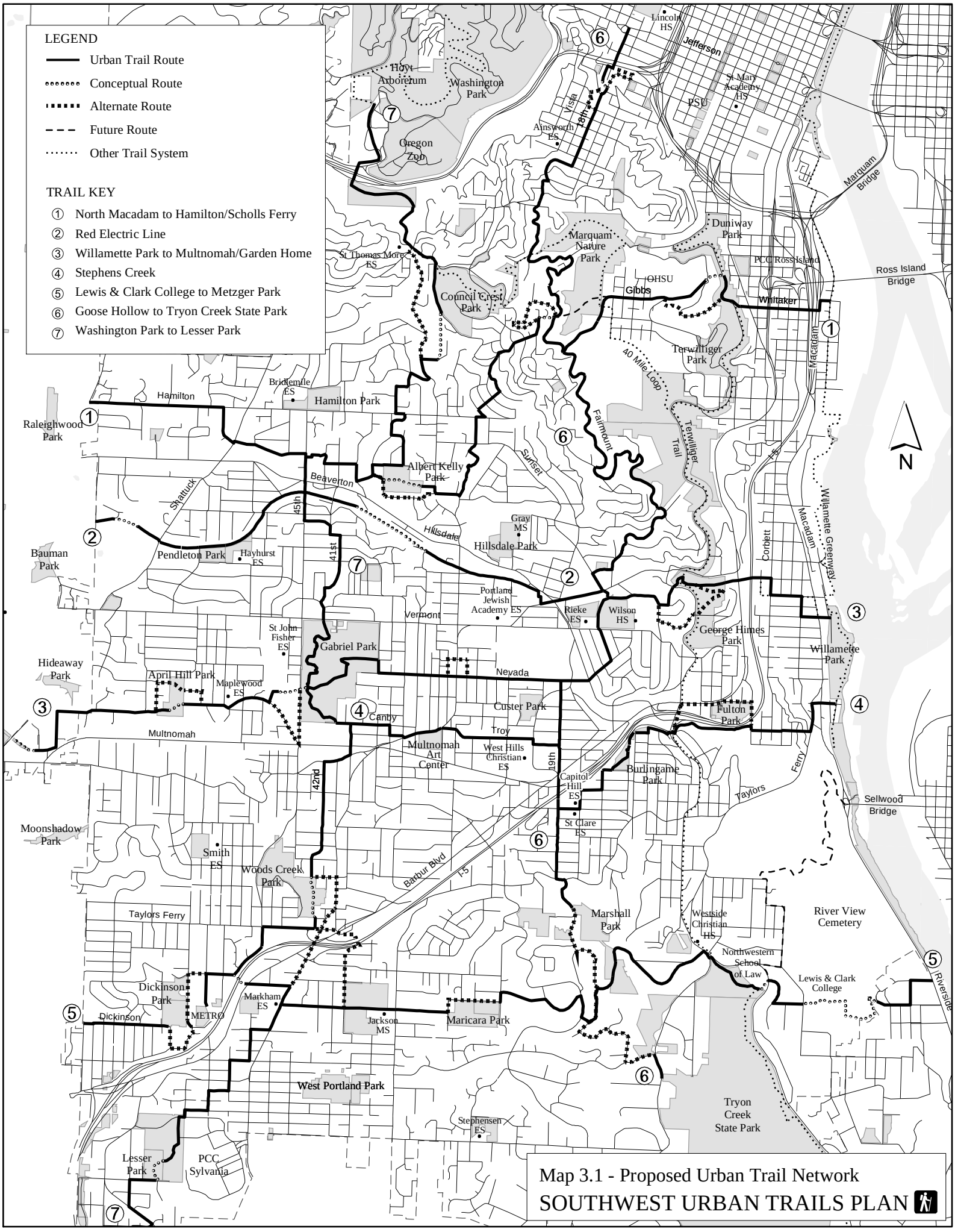
B

INTRODUCTION

The Southwest Urban Trails Plan was completed in July 2000. The goals of the plan were to:

- Identify a primary trail network from the potential pedestrian routes map
- Identify design, construction, and right-of-way issues
- Develop recommendations for funding and construction, including volunteer help
- Involve the community

Included in this appendix is a map of the proposed southwest urban trails network.



Map 3.1 - Proposed Urban Trail Network

SOUTHWEST URBAN TRAILS PLAN

SW COMMUNITY PLAN TRANSPORTATION POLICY AND OBJECTIVES

C

INTRODUCTION

Appendix C includes the Southwest Community Plan transportation policies and objectives, adopted in July 2000 .

Southwest Community Plan

Vision, Policies and Objectives

City of Portland
Bureau of Planning
Portland, Oregon

July 2000

Transportation

Provide a balanced, multimodal transportation system in Southwest Portland that encourages increases in transit use and pedestrian accessibility and connectivity, discourages non-local traffic in residential areas, manages congestion, and focuses on improving and maintaining arterial and local streets.

Objectives

1. Support the development of pedestrian facilities, including safe crosswalks, identified in the Pedestrian Master Plan and the SW Trails maps on arterials and local streets, at major intersections and bus stops, on unimproved rights-of-way, and across public and private lands where appropriate to provide connections between residential areas and activity centers.

2. Enhance access for bicyclists by developing and completing bicycle facilities on designated bikeways within and to activity centers and by adding public bicycle parking where needed.

3. Improve circulation for transit, automobiles and truck traffic by constructing direct interchanges between regional trafficways and major city traffic streets, by improving accessibility to activity centers, and by providing better connectivity of major streets and operations of multimodal intersections.

4. Improve intradistrict and interdistrict transit service in the peak and off-peak periods to serve residential areas, town centers, main streets, and activity centers, particularly those in the Southwest district, and add transit facilities and pedestrian ways to enhance access to transit.

5. Support major institutions in neighborhoods, including Oregon Health Sciences University, Portland Community College, and Lewis and Clark College, by encouraging the provision of high-quality transit service and facilities to serve them; requiring transportation demand management programs to mitigate impacts on neighborhoods, and improving the adjacent and internal pedestrian facilities surrounding and within to enhance access.

6. Reinforce the primary transportation functions of designated scenic drives and parkways.

7. Develop additional pedestrian facilities within the Hillsdale, Multnomah and Johns Landing Pedestrian Districts.

8. Adopt new pedestrian districts and develop pedestrian facilities in Southwest activity centers as area plans are completed and appropriate zoning is adopted.

9. Encourage pedestrian activity and include on-street parking in town centers and along main streets to support their economic vitality.

10. Use a broad range of cost-effective approaches taking into consideration existing topography and drainage patterns and protection of the natural environment when building and maintaining pedestrian ways and streets in Southwest to reflect their varying functions, classifications, and character.

11. Evaluate the transportation impacts on neighborhoods and arterials when changing the development potential of an area.

12. Analyze potential transportation impacts and require appropriate mitigation measures for new development consistent with review processes and provisions of the City Code.

13. Evaluate and test a toolbox of street designs and materials to carry out the Southwest transportation objectives.

14. Improve coordination among bureaus, agencies, and jurisdictions, and seek partnerships to implement Southwest transportation objectives and finance projects.

15. Address safety and congestion concerns through a combination of enforcement, education, and encouragement of legal behavior, emphasizing safety on arterials and both safety and livability on residential streets.

16. Inventory the existing status and condition of the major elements of the transportation system including pedestrian and transit users' safety.

17. Establish goals and benchmarks to measure progress towards street improvement and provision of pedestrian and transit facilities.

18. Take into consideration the existing condition of streets in the vicinity of a site, as well as their planned function, when considering quasi-judicial land use changes that rely on adequacy of services as an approval criterion.

19. Facilitate citizen participation in transportation planning, project prioritization, and project development and implementation including a dynamic dialogue model soliciting input from the broadest possible audience and using the knowledge and resources of Southwest citizens.

20. Support the volunteer efforts of residents, businesses, and organizations in carrying out activities that promote accomplishment of the transportation objectives and enhance the Southwest community.

WATER AVENUE RAMP ANALYSIS

D

INTRODUCTION

Appendix D provides the analysis findings for removing the Water Avenue ramp to southbound I-5 from the 2020 RTP Strategic road network.

October 25, 2001

To: TSP File
From: Ken Lindmark

Subject: Initial Water Ave Ramp Analysis Findings

The 2020 road network from the RTP Strategic scenario includes a ramp from Water Avenue to s/b I-5. Policy staff asked me to examine the impacts of not adding the ramp to the road system.

Ramp Traffic

The 2020 2 hour PM peak model for the RTP Strategic scenario was used for this analysis. A select link analysis was performed to isolate the traffic using the ramp. The following table enumerates the origins and destinations of the peak period vehicle trips using the ramp.

Table 1. 2020 2 Hr. PM peak Vehicle Trips using the Water Ave Ramp to s/b I-5

		Destinations:								
		CBD	N. Macadam	SW	NW	St. Helens	Bvrtn/Hlsbr	Tig/Tual/LO	Ore. City/rural	
Origins:		gv01	gv05	gv12	gv13	gv14	gv15	gv16	gv17	**sum**
Lloyd Dist.	gv03	20	12	185	0	0	8	237	1	**463**
CEID	gv04	34	22	462	26	9	347	474	3	**1,379**
NE	gv08	4	2	20	0	0	1	25	0	**51**
SE	gv09	40	7	267	6	0	177	288	1	**785**
	sum	**97**	**43**	**938**	**32**	**9**	**532**	**1,026**	**5**	**2,685**

Of the 2,685 vehicles expected to use the ramp, over 1,800 (about 70%) originate in the CEID or Lloyd District. Over 1,500 (nearly 60%) of the vehicles using the ramp have destinations in Washington or Clackamas counties or points south. Over 900 vehicles have destinations in SW Portland. The attached plots (Fig. 1 & 2) illustrate the facilities that these trips are expected to use (i.e., US 26 west; I-5 south; and SR 43).

Traffic without the Ramp

The traffic using the ramp was saved as an origin-destination table in the model. This table was then assigned to a road network without the ramp. The result is a picture of the routes that the ramp traffic would use – a sort of 'detour' scenario. This assignment accounts for the all of the congestion effects of the diverted ramp traffic as well as the other traffic on the system so that the route choices within the model accurately reflects driver behavior.

The attached plots (Figs. 3 & 4) show the routes and volumes for this scenario. Lloyd District traffic that was formerly using the ramp shifts to the Broadway ramp to s/b I-5.

CEID traffic shifts to the Hawthorne, Ross Island and Morrison bridges. Since this traffic is destined for the freeway system, Front Avenue and Market Street are used more heavily than the scenario with the ramp.

Additional plots (Fig. 5 & 6) are also provided which show the net change in peak period traffic without the ramp - not just the diverted ramp traffic as in the previous plots. Again, increases in volume would be expected on the three bridges as well as some downtown streets. Decreases in volume are found on the Marquam Bridge and I-405.

Conclusions

This preliminary analysis shows that the Water Avenue ramp to s/b I-5 is expected to serve primarily as access to the freeway system for some of the trips generated by the CEID and Lloyd District. Not surprisingly, these most of these trips have destinations outside the City. Without the ramp, these trips would use downtown bridges and streets to access the freeway system. It is important to note that for this analysis, no examination of changes to demand or mode choice were made. In other words, all of the assumptions present in the RTP Strategic scenario were maintained.

SYSTEM PERFORMANCE

E

INTRODUCTION

Appendix E includes the following sub-sections:

- E.1: Vehicle Miles Traveled/Capita Methodology
- E.2: Culvert Ranking Criteria
- E.3: High Accident Location List
- E.4: How to do a Fixed Route Travel Time Study
- E.5: ITS Corridors Travel Time and Speed Summaries 

June 27, 2001

Memo

To: TSP File
From: Ken Lindmark, Sr. Transportation Planner

Subject: VMT Calculations for TSP Performance Measures

This memo provides a summary of the methodology for calculating Vehicle Miles Traveled (VMT) as well as some initial findings. VMT is considered an important measure of the reliance on autos for urban mobility. VMT per capita is often used as an indicator of individual vehicle use. Many studies have shown that VMT per capita in this region has been increasing. In response to this trend, the state's Transportation Planning Rule adopted in 1991 and revised in 1998 called for the region's Metropolitan Planning Organization to reduce VMT per capita by 10% over the next twenty years.

There are several reasons why it is important to provide a clear explanation of how the results in this analysis were obtained. VMT is not a directly observed measurement and there are several ways to estimate it. Methodological differences can produce variable and potentially meaningless results. Also, the City's Transportation System Plan requires measurement of the plan's performance over time. Future updates of the system plan will revisit performance measures, like VMT, making a consistent methodology an important factor.

What is VMT?

Description of terms

VMT is a measure that is commonly used to describe automobile use on a daily or annual basis. It incorporates both the number of vehicle trips and the length of those trips. While traffic counts measure the number of vehicles passing a fixed point during a specified time, VMT includes trip distance with the traffic volume. For example, 10,000 vehicles each traveling an average of 15 miles per day would result in 150,000 vehicle miles traveled per day.

VMT is useful as a descriptor of changes in travel demand in an urban area. As trip lengths increase, VMT goes up. Trip lengths are a function of the relative locations of residences, jobs, schools, and retail.

As the number of vehicle trips increase, VMT again goes up. Factors affecting the number of vehicle trips made each day include age, income, population and household size, workers per household, auto ownership, and access to transit.

Accuracy

The primary limitation of measuring VMT is that it is not directly observed. There is no method of measuring the trip distances of all vehicles on a given day. However, the models, which estimate travel within the region, can be used to derive vehicle miles traveled. As a result, VMT is accurate within the normal constraints of the model.

How is VMT estimated?

Typical methodologies

Two disparate methodologies are used for estimating VMT. The network-based approach starts with the traffic volume on a roadway segment and multiplies by the length of that segment. This is done for each segment; then all segments are added together to get a composite VMT for the system. This approach can miss the VMT associated with local streets which are typically excluded from most models. Also, the network-based VMT methodology cannot account for the component parts of traffic such as trip origins, destinations or trip purposes. It remains useful in estimating VMT for large areas such as a region or a state. A good summary of VMT trends in the Metro using this methodology was produced by Metro in 1999.

The trip-based approach multiplies average vehicle trip lengths (derived from the model) by the number of vehicle trips to establish VMT. Since our models can identify vehicle trips by origin, destination and purpose, this approach is valuable for sub-regional analysis. Local travel is identified through intra-zonal trips (travel within a zone). The trip-based method is most applicable to the needs of this analysis.

Calculations and sources for TSP VMT Calculations

All VMT calculations for this report used data from the City's conversion of Metro's Regional model. Specifically, the model represents the 2020 Strategic scenario of the Regional Transportation Plan (Round 3). The Strategic scenario assumed that enough new revenue sources could be found to maintain current operations, maintenance and preservation. In general, this scenario represents the region's definition of an adequate transportation system in that most state and regional requirements and performance measures are met. The base year in the model is 1994 and, therefore, is used as the base year for this analysis.

The daily travel demand from the model is separated into its six component trip purposes. The Transportation Planning Rule definition of VMT excludes buses, heavy trucks, and through trips. Therefore, transit, commercial and external trip purposes are excluded from this analysis.

To create daily vehicle trips, daily auto person trips by purpose are multiplied by auto occupancy rates for each purpose. VMT is obtained from the product of vehicle trips and the zone to zone distances.

The basic geographic unit of the model is the transportation analysis zone (TAZ). The four-county region consists of 1260 TAZs. The City of Portland is made up of 365 TAZs. The travel demand, in the form of 1260 by 1260 zone matrices, was combined into groups or districts according to Central City and Transportation Element Districts (see map, Figure 1) in order to make the analysis more manageable. District boundaries are the closest approximations of the original districts based on the traffic analysis zones.

Findings

VMT Totals

Splitting the VMT into productions and attractions helps describe the effects of population and job growth. In general, trips (and thus VMT) are produced at the home and attracted to employment. The two tables below show the VMT in terms of productions and attractions for the City of Portland and the rest of the region.

Table 1 - 1994 Daily Vehicle Miles Traveled (millions)

	Attracted to Portland	Attracted to Rest of Region	Total Regional Attractions
Produced from Portland	**4.8**	**2.4**	**7.2**
Produced from Rest of Region	**5.7**	**11.7**	**17.4**
Total Regional Productions	**10.5**	**14.1**	**24.6**

Source: Metro 1260 zone model covering 4 county area; from RTP, Strategic Scenario, Round 3, city conversion
Note: VMT excludes commercial and external trips.

The region (Multnomah, Clackamas, Washington and Clark counties) generates an estimated 24.6 million vehicle miles traveled on a typical weekday. According to current regional forecasts, by 2020 this will increase to 38.2 million miles traveled.

The City of Portland is estimated to account for 12.9 million VMT in 1994 (5.7 million attracted to Portland from outside the city limits, 2.4 million VMT produced by Portland and attracted outside, and 4.8 million VMT internal to Portland). It is important to note that the distance component of the VMT produced by and attracted to Portland is length of the entire trip – not just the part that is within Portland's city limits.

More vehicle trips are attracted to Portland jobs (10.5 million VMT) than are produced by Portland households (7.2 million VMT) on a typical weekday. Portland's share of the region's employment is nearly one-half (46%) while its share of the region's population is one-third (33%).

Table 2 - 2020 Daily Vehicle Miles Traveled (millions)

	Attracted to Portland	Attracted to Rest of Region	Total Regional Attractions
Produced from Portland	**5.3**	**3.4**	**8.7**
Produced from Rest of Region	**8.3**	**21.1**	**29.4**
Total Regional Productions	**13.6**	**24.5**	**38.2**

Source: Metro 1260 zone model covering 4 county area; from RTP, Strategic Scenario, Round 3, city conversion
Note: VMT excludes commercial and external trips.

In 2020, the City of Portland's VMT is estimated to increase to 17 million (8.3 million attracted to Portland from outside the city limits, 3.4 million produced by Portland and attracted outside, and 5.3 million internal to Portland). This is a change of 32% while growth in VMT outside of the city is 80%. Two factors influence this trend. The growth in jobs and population is expected to occur at a faster rate outside of the city. And, future transit service is expected to carry a higher proportion of the travel demand within the city.

VMT per Capita

In an attempt to make VMT more descriptive, it is often presented as VMT per capita. Simply put, this is the daily mileage an average person travels by vehicle per day. For large geographic areas, where the bulk of the travel activity begins and ends within the area, this is a straightforward approach. The VMT is simply divided by the total population.

As smaller areas are examined, this method fails. A good example is the CBD. In 1994, it produced 354,000 daily VMT. Dividing by the CBD population of 8,726 yields a result of 40.6 VMT per capita (nearly three times higher than the regional VMT per capita of 15.8). Clearly, this makes no sense. The problem is that the VMT from our example contains a large portion of trips that are not produced by downtown residents. Rather, the CBD employment contributes to a larger share of the trips, and thus the VMT, produced.

In addition, the example above doesn't account for the 1.4 million VMT that are attracted to the CBD each day. Ignoring this share of the total VMT would lead to some very faulty conclusions at less than regional scales.

In order to evaluate VMT per capita in smaller geographic areas such as the districts in Figure 1, productions and attractions must be tracked separately. Further, for the productions, residential and work related trip purposes must also be separated. Basically, residential VMT produced includes the Home based trip purposes while the work VMT produced includes the Non-home based trip purposes. The residential component is divided by population and the work component is divided by employment. (A drawback to this approach is that VMT per capita results are not additive to one number for the entire city. For VMT attracted to a district, no separate components are needed since attractions, in the model, are a function of employment in the district.)

This method allows the VMT per capita to be examined in a much more meaningful way for the city. Table 3 presents the change in the city's VMT over time using this method.

Table 3 – Change in City's VMT per capita

	Produced by the City		
	Residential	Work	Attracted to the City
Year	VMT/Resident	VMT/Employee	VMT/Employee
1994	9.35	5.44	24.19
2020	8.53	5.49	22.24
Change	**-9%**	**+1%**	**-8%**

Given the assumptions in the Strategic scenario of the RTP, the City of Portland comes very close to meeting it's share of the regional goal of reducing VMT per capita by 10% over twenty years. The residential VMT per capita productions (which represent Portland residents' travel to jobs, schools, shopping, etc.) is expected to drop by 9%. Only one city district, Northwest, showed an increase in this category. The work VMT per capita produced (non-commute travel by employees in Portland) is expected to rise by 1%. Three city districts show increases in this category – Northeast, Southeast and Far Northeast. VMT per capita attracted to the city (travel attracted to city jobs) is expected to drop by 8%. Northeast and Southeast are the only districts with increases in this category.

Tables 4 and 5 present the VMT per capita for each of the districts and the region as a whole for 1994 and 2020, respectively. These tables provide a more detailed comparison of districts within the city. It is important to note here that, for our analysis, the regional VMT includes the entire four county area. In the Regional Transportation Plan, VMT per capita was calculated excluding both Clark County and the area outside of the UGB.

Table 4 - 1994 VMT by District

				1994 VMT (Produced by:)[1]				1994 VMT (Attracted to:)[4]	
	District	1994 Population	1994 Employment	Residential[2]	vmt/pop	Work[3]	vmt/emp	All Purposes	vmt/emp
1	CBD	8,726	102,833	30,242	**3.47**	323,734	**3.15**	1,412,277	**13.73**
2	L. Albina	271	1,966	1,400	**5.17**	8,632	**4.39**	35,871	**18.25**
3	Lloyd Dist	231	17,142	1,816	**7.86**	109,014	**6.36**	432,942	**25.26**
4	CEID	5,614	23,687	29,133	**5.19**	90,264	**3.81**	403,973	**17.05**
5	N. Macadam	146	3,046	1,271	**8.71**	14,741	**4.84**	53,778	**17.66**
6	Goose Hollow	4,330	5,144	19,174	**4.43**	18,606	**3.62**	104,920	**20.40**
7	North	45,099	35,829	397,615	**8.82**	247,042	**6.90**	991,720	**27.68**
8	Northeast	106,548	60,051	911,320	**8.55**	460,566	**7.67**	1,997,410	**33.26**
9	Southeast	147,204	61,538	1,223,338	**8.31**	367,218	**5.97**	1,683,655	**27.36**
10	Far NE	44,531	24,280	532,208	**11.95**	159,908	**6.59**	718,759	**29.60**
11	Far SE	61,961	20,271	736,682	**11.89**	145,572	**7.18**	669,378	**33.02**
12	Southwest	69,914	39,334	763,238	**10.92**	229,419	**5.83**	1,106,475	**28.13**
13	Northwest	18,782	39,061	150,522	**8.01**	186,554	**4.78**	892,539	**22.85**
14	St. Helens	2,820	595	65,926	**23.38**	7,016	**11.79**	16,520	**27.76**
15	Bvrtn/Hlsb	285,810	143,345	3,389,948	**11.86**	804,339	**5.61**	3,244,618	**22.64**
16	Tig/Tual/LO	148,147	105,628	1,947,304	**13.14**	722,944	**6.84**	2,797,288	**26.48**
17	Ore. City	84,952	27,069	1,633,151	**19.22**	207,291	**7.66**	939,947	**34.72**
18	HV/Sandy	61,009	32,985	1,068,962	**17.52**	223,480	**6.78**	981,724	**29.76**
19	Milw/Glad	83,267	41,098	992,733	**11.92**	320,091	**7.79**	1,458,058	**35.48**
20	Gresham	90,865	38,986	1,146,744	**12.62**	268,535	**6.89**	1,300,199	**33.35**
21	Clark Co.	282,437	123,759	3,972,579	**14.07**	667,372	**5.39**	3,355,594	**27.11**
	Central City	19,318	153,818	83,036	**4.30**	564,990	**3.67**	2,443,759	**15.89**
	Rest of City	494,039	280,364	4,714,924	**9.54**	1,796,279	**6.41**	8,059,936	**28.75**
	Total City	513,357	434,182	4,797,960	**9.35**	2,361,269	**5.44**	10,503,695	**24.19**
	Rest of Region	1,039,307	513,465	14,217,347	**13.68**	3,221,067	**6.27**	14,093,949	**27.45**
	Total Region	**1,552,664**	**947,647**	**19,015,307**	**12.25**	**5,582,337**	**5.89**	**24,597,644**	**25.96**

1 VMT (Produced by:) = AWD Vehicle Miles Traveled for Trips produced in a district regardless of destination.
2 Residential VMT includes all Home Based trip purposes and the residential component of the NHNW purpose.
3 Work VMT includes all Non-Home Based trip purposes except the residential component of the NHNW purpose.

4 VMT (Attracted to:) = AWD Vehicle Miles Traveled for Trips attracted to a district regardless of origin.

All data is from RTP - Round 3, Strategic Scenario. External and commercial trips are excluded.

Table 5 - 2020 VMT by District

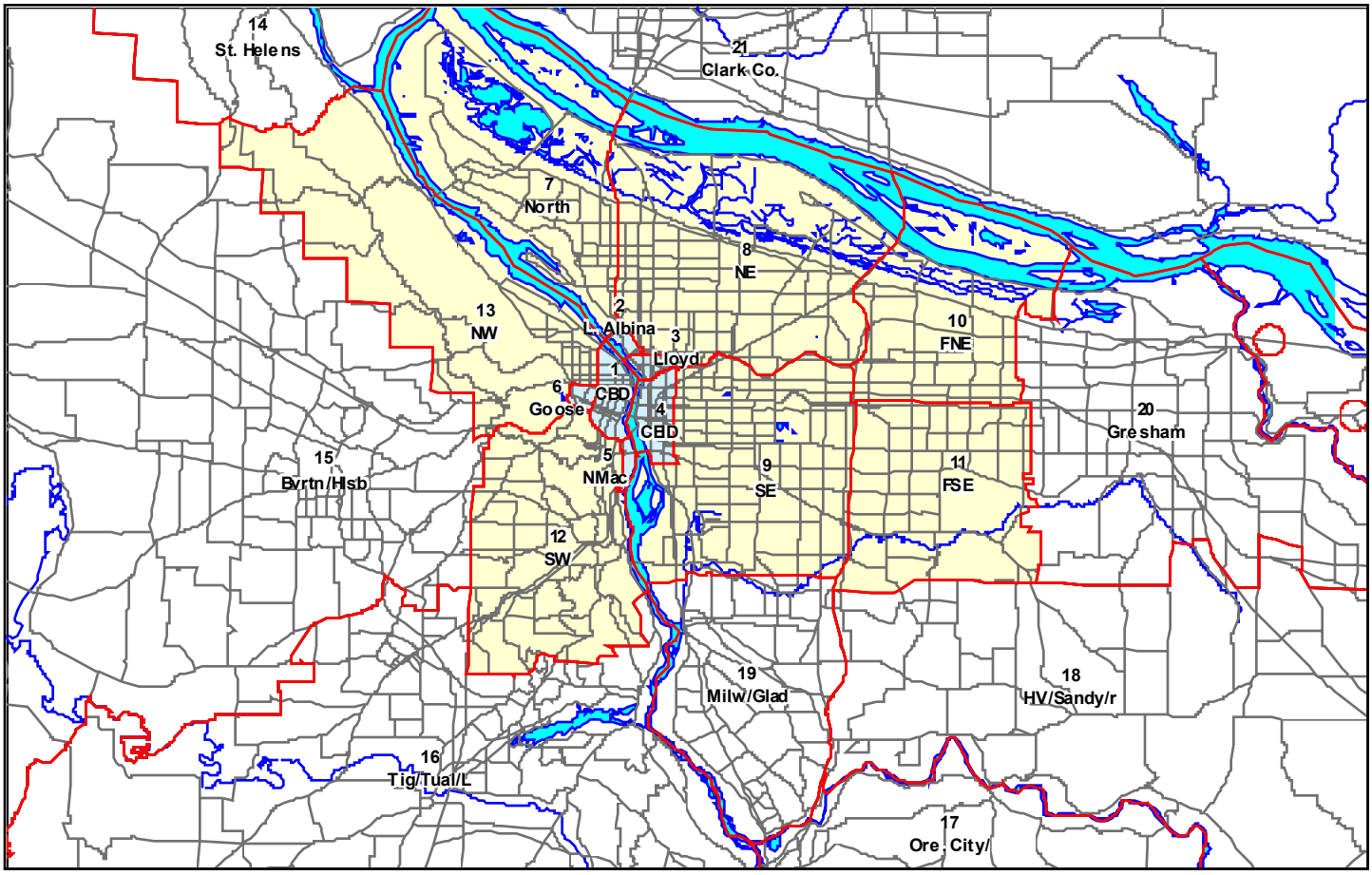
	District	2020 Population	2020 Employment	2020 VMT (Produced by:)[1] Residential[2]	vmt/pop	Work[3]	vmt/emp	2020 VMT (Attracted to:)[4] All Purposes	vmt/emp
1	CBD	18,775	153,139	40,927	**2.18**	451,379	**2.95**	1,377,914	**9.00**
2	L. Albina	299	3,117	833	**2.79**	10,647	**3.42**	30,323	**9.73**
3	Lloyd Dist	1,935	29,896	5,434	**2.81**	145,048	**4.85**	466,324	**15.60**
4	CEID	6,514	30,552	24,826	**3.81**	118,286	**3.87**	496,317	**16.24**
5	N. Macadam	2,812	13,972	15,612	**5.55**	64,043	**4.58**	222,199	**15.90**
6	Goose Hollow	4,858	6,286	12,261	**2.52**	25,575	**4.07**	84,478	**13.44**
7	North	53,735	50,658	394,327	**7.34**	343,725	**6.79**	1,364,709	**26.94**
8	Northeast	121,572	90,394	951,567	**7.83**	793,316	**8.78**	3,227,036	**35.70**
9	Southeast	160,223	71,973	1,159,042	**7.23**	454,588	**6.32**	2,007,846	**27.90**
10	Far NE	55,811	34,101	595,806	**10.68**	234,026	**6.86**	963,876	**28.27**
11	Far SE	105,998	36,743	1,174,360	**11.08**	241,245	**6.57**	992,996	**27.03**
12	Southwest	72,742	44,836	774,254	**10.64**	260,826	**5.82**	1,348,970	**30.09**
13	Northwest	26,522	46,543	237,629	**8.96**	217,748	**4.68**	1,030,681	**22.14**
14	St. Helens	5,496	565	132,717	**24.15**	6,805	**12.04**	20,960	**37.10**
15	Bvrtn/Hlsb	435,970	309,724	4,491,870	**10.30**	1,726,429	**5.57**	5,970,884	**19.28**
16	Tig/Tual/LO	227,714	182,143	3,016,812	**13.25**	1,203,194	**6.61**	4,380,093	**24.05**
17	Ore. City	157,315	49,110	2,933,345	**18.65**	354,179	**7.21**	1,630,256	**33.20**
18	HV/Sandy	172,207	74,504	2,703,338	**15.70**	448,972	**6.03**	1,836,903	**24.66**
19	Milw/Glad	96,535	73,132	1,050,288	**10.88**	548,170	**7.50**	2,474,871	**33.84**
20	Gresham	143,303	81,045	1,732,275	**12.09**	535,055	**6.60**	2,156,842	**26.61**
21	Clark Co.	474,289	228,523	7,234,577	**15.25**	1,289,317	**5.64**	6,070,193	**26.56**
	Central City	35,193	236,962	99,893	**2.84**	814,979	**3.44**	2,677,555	**11.30**
	Rest of City	596,603	375,248	5,286,984	**8.86**	2,545,473	**6.78**	10,936,115	**29.14**
	Total City	631,796	612,210	5,386,878	**8.53**	3,360,452	**5.49**	13,613,670	**22.24**
	Rest of Region	1,712,829	998,746	23,295,222	**13.60**	6,112,120	**6.12**	24,541,002	**24.57**
	Total Region	**2,344,625**	**1,610,956**	**28,682,100**	**12.23**	**9,472,572**	**5.88**	**38,154,672**	**23.68**

1 VMT (Produced by:) = AWD Vehicle Miles Traveled for Trips produced in a district regardless of destination.
2 Residential VMT includes all Home Based trip purposes and the residential component of the NHNW purpose.
3 Work VMT includes all Non-Home Based trip purposes except the residential component of the NHNW purpose.

4 VMT (Attracted to:) = AWD Vehicle Miles Traveled for Trips attracted to a district regardless of origin.

All data is from RTP - Round 3, Strategic Scenario. External and commercial are excluded.

Figure 1 – District Boundaries



Note: Districts are made up of aggregations of Traffic Analysis Zones from the Regional 1260 zone system. In some cases, the district boundaries do not coincide precisely with jurisdictional boundaries.

HIGH ACCIDENT LOCATION LIST

E.3

1994 - 1997

INTERSECTION	TOTAL CRASHES	# of FATAL CRASHES	# OF INJURY CRASHES	# OF PROPERTY DAMAGE ONLY	CRASHES BY YEAR				TRAFFIC VOLUME	CRASH RATE
					1994	1995	1996	1997		
SE ANKENY ST at 6TH AVE	20	0	11	9	5	5	4	6	4020	3.66
SE STARK ST at 2ND AVE	30	0	9	21	7	15	2	6	6099	3.62
SW MARKET ST at 1ST AVE	64	0	33	31	15	30	11	8	15310	3.07
N COOK ST at WILLIAMS AVE	34	0	13	21	4	7	9	14	9429	2.65
SW FRONT ST/ROSS ISL. BR. (3001) at ZONE 15	95	0	46	49	27	23	30	15	28695	2.43
SE STARK ST at 102ND AVE	85	0	34	51	17	21	23	24	29587	2.11
SW MADISON ST at 6TH AVE	28	0	11	17	6	6	9	7	9796	2.10
SW OAK ST at 5TH AVE	20	0	11	9	3	2	5	10	7753	1.90
N BROADWAY at VANCOUVER AVE / I-5 SB OFF-RAMP	83	0	31	52	16	18	21	28	34380	1.78
NW EVERETT ST at 22ND AVE	21	0	8	13	7	3	7	4	9716	1.59
N ALBERTA ST at MISSOURI AVE	30	0	19	11	8	7	9	6	13908	1.59
NE WEIDLER ST at GRAND AVE	88	1	46	41	19	28	25	16	43583	1.48
NE DAVIS ST at 12TH AVE	21	0	10	11	7	6	5	3	10433	1.48
SE MAIN ST at 162ND AVE	20	1	13	6	6	3	5	6	10031	1.47
SE DIVISION ST at 39TH AVE	20	0	12	8	3	4	7	6	10062	1.46
NE HALSEY ST at 9TH AVE	23	0	8	15	7	7	4	5	11789	1.43
NE HALSEY ST at 47TH AVE / EUCLID AVE	43	1	25	17	10	9	12	12	22584	1.40
N COOK ST at VANCOUVER AVE	28	0	12	16	9	4	8	7	14886	1.38
SE MADISON ST at 6TH AVE	20	0	8	12	2	8	6	4	11084	1.33
N PORTLAND BLVD at ALBINA AVE	26	0	14	12	7	5	10	4	14488	1.32
SE BYBEE BLVD at 17TH AVE	34	0	14	20	8	11	7	8	18954	1.32
E BURNSIDE ST at 80TH AVE	20	0	14	6	4	4	5	7	11246	1.31
N BROADWAY at WILLIAMS AVE / I-5 NB ON-RAMP	77	0	32	45	14	16	19	28	43622	1.30
SE BELMONT ST at 60TH AVE	28	0	16	12	8	7	10	3	15882	1.30
NW EVERETT ST at PARK AVE	21	0	6	15	6	4	7	4	12043	1.28
NW EVERETT ST at 20TH AVE	20	0	10	10	4	7	4	5	11533	1.28
SE WASHINGTON ST at 102ND AVE	50	0	20	30	8	17	12	13	28905	1.27
SE WASHINGTON ST at 103RD DR	46	0	24	22	9	10	13	14	26994	1.25
NE SANDY BLVD at 39TH AVE	60	0	25	35	16	17	14	13	35526	1.24
NE WEIDLER ST at VICTORIA AVE / I-5 NB OFF-RAMP	63	0	36	27	7	12	23	21	37775	1.23
NW EVERETT ST at 6TH AVE	20	0	13	7	3	6	4	7	12043	1.22
NE HALSEY ST at 102ND AVE	61	0	32	29	13	10	14	24	38900	1.15

HIGH ACCIDENT LOCATION LIST
1994 - 1997

INTERSECTION	TOTAL CRASHES	# of FATAL CRASHES	# OF INJURY CRASHES	# OF PROPERTY DAMAGE ONLY	CRASHES BY YEAR				TRAFFIC VOLUME	CRASH RATE
					1994	1995	1996	1997		
SE POWELL BLVD at 82ND AVE	87	0	55	32	15	18	28	26	56275	1.14
SE STARK ST at I-205 SB GLISAN-STAR	43	0	30	13	8	17	10	8	27859	1.13
SE WASHINGTON ST at 92ND AVE	28	0	17	11	6	3	12	7	18347	1.12
SE HOLGATE BLVD at 17TH AVE	52	0	30	22	14	13	17	8	34165	1.12
NE BROADWAY at GRAND AVE	66	0	18	48	20	23	11	12	43916	1.11
SW BARBUR BLVD at 60TH AVE	30	1	16	13	5	10	5	10	20272	1.09
SE FOSTER RD at 96TH AVE / I-205 NB ON-RAMP	39	1	15	23	14	7	11	7	26460	1.08
NE WEIDLER ST at 9TH AVE	42	0	22	20	13	7	15	7	29105	1.06
SE DIVISION ST at 52ND AVE	28	0	17	11	8	3	9	8	19577	1.05
SE STARK ST at 60TH AVE	26	0	10	16	4	10	4	8	18239	1.05
N WEIDLER ST at VANCOUVER AVE	46	0	12	34	8	14	7	17	32626	1.04
SE CLINTON ST at 12TH AVE	20	0	8	12	8	7	2	3	14274	1.03
NE WEIDLER ST at 19TH AVE	23	0	9	14	8	4	5	6	16555	1.02
W BURNSIDE ST at 14TH AVE	36	1	9	26	9	12	7	8	26269	1.01
NE HALSEY ST at 60TH AVE	24	0	15	9	4	9	3	8	17522	1.01
SE TACOMA ST at 13TH AVE	44	0	27	17	12	7	10	15	32378	1.00
SE MORRISON ST at 6TH AVE	23	0	9	14	7	10	4	2	16969	1.00
SE FOSTER RD at 72ND AVE	38	1	23	14	8	17	6	7	28107	0.99
NW EVERETT ST at 10TH AVE	22	0	11	11	3	5	10	4	16360	0.99
SE MADISON ST at GRAND AVE	53	0	33	20	16	13	13	11	39566	0.98
NE GLISAN ST at 82ND AVE	65	0	36	29	20	18	22	5	48663	0.98
SE FOSTER RD at 92ND AVE	36	0	13	23	7	9	11	9	26984	0.98
N ALBERTA ST at WILLIAMS AVE	20	0	11	9	3	8	5	4	15302	0.96
SE WASHINGTON ST at 100TH AVE	29	0	14	15	7	7	9	6	22195	0.96
SE HOLGATE BLVD at 26TH AVE	44	0	25	19	13	14	11	6	33716	0.96
SE DUKE ST at 82ND AVE	35	0	24	11	4	10	8	13	26926	0.96
SE WASHINGTON ST at I-205 NB EXTO WASH-S	41	1	23	17	12	13	10	6	31933	0.94
SE WOODSTOCK BLVD at 72ND AVE	25	0	12	13	3	7	5	10	20472	0.90
NE SANDY BLVD at 47TH AVE	38	0	19	19	12	4	12	10	31161	0.90
SE DIVISION ST at 162ND AVE	50	0	24	26	10	10	16	14	41068	0.90
SE TACOMA ST at 17TH AVE	39	0	16	23	9	9	10	11	32079	0.89
NE MARINE DR at 122ND AVE	26	1	12	13	6	8	6	6	21436	0.89

HIGH ACCIDENT LOCATION LIST
1994 - 1997

INTERSECTION	TOTAL CRASHES	# of FATAL CRASHES	# OF INJURY CRASHES	# OF PROPERTY DAMAGE ONLY	CRASHES BY YEAR				TRAFFIC VOLUME	CRASH RATE
					1994	1995	1996	1997		
SE HAWTHORNE BLVD at 11TH AVE	24	0	7	17	3	4	7	10	19842	0.89
NE COLUMBIA BLVD at KILLINGSWORTH ST	51	0	30	21	14	14	12	11	42175	0.89
NE SANDY BLVD at 122ND AVE NB RAMP	26	0	18	8	7	5	9	5	21501	0.89
NE SANDY BLVD at 57TH AVE / ALAMEDA	39	0	19	20	7	11	11	10	32302	0.89
SE WOODSTOCK BLVD at 39TH AVE	28	0	15	13	11	5	5	7	23256	0.89
SW JEFFERSON ST at 4TH AVE	25	0	16	9	10	5	4	6	20835	0.88
NE HALSEY ST at 39TH AVE	33	0	19	14	4	14	4	11	27642	0.88
NE SANDY BLVD at 72ND AVE / FREMONT ST (4007 ALL ZN)	33	0	10	23	3	11	10	9	27921	0.87
SE DIVISION ST at 12TH AVE	23	0	12	11	7	6	2	8	19507	0.87
N KILLINGSWORTH ST at VANCOUVER AVE	20	0	17	3	5	6	6	3	17141	0.86
NE MULTNOMAH ST at 9TH AVE	20	0	11	9	5	7	3	5	17280	0.85
SE HOLGATE BLVD at MILWAUKIE AVE	27	0	14	13	10	3	7	7	23350	0.85
NE GLISAN ST at 39TH AVE	30	0	18	12	3	5	8	14	25952	0.85
SE BELMONT ST at 39TH AVE	40	0	22	18	12	9	9	10	34610	0.85
N LOMBARD ST at PORTSMOUTH AVE	25	0	16	9	9	6	6	4	21771	0.84
NE GLISAN ST at 99TH AVE	45	0	26	19	10	10	12	13	39590	0.84
SE BELMONT ST at 11TH AVE	22	0	12	10	7	4	5	6	19356	0.84
NE SANDY BLVD at 38TH AVE	27	0	15	12	4	7	5	11	23787	0.83
NW GLISAN ST at 16TH AVE / I-405 SB OFF-RAMP	28	0	9	19	9	4	10	5	24692	0.83
SW MADISON ST at 3RD AVE	21	0	9	12	5	2	6	8	18571	0.83
SW JACKSON ST at BROADWAY	21	0	11	10	5	5	7	4	18616	0.83
E BURNSIDE ST at 16TH AVE	20	0	12	8	4	5	4	7	17747	0.83
SE FOSTER RD at 94TH AVE / I-205 SB OFF-RAMP	24	0	9	15	6	5	7	6	21459	0.82
SW MULTNOMAH BLVD at 45TH AVE	26	0	18	8	8	7	6	5	23480	0.81
NE KILLINGSWORTH ST at 42ND AVE	23	0	16	7	7	8	4	4	20942	0.81
NE WEIDLER ST at 15TH AVE	29	0	23	6	5	8	10	6	26804	0.80
SW GARDEN HOME RD at OLESON RD	31	0	12	19	7	9	9	6	28931	0.79
NE FREMONT ST at 82ND AVE	26	1	18	7	1	9	9	7	24285	0.79
SE STARK ST at 105TH AVE	20	0	9	11	5	6	5	4	18681	0.79
NE CLACKAMAS ST at GRAND AVE	21	0	12	9	10	5	5	1	19707	0.78
E BURNSIDE ST at GRAND AVE	63	1	39	23	14	19	13	17	59167	0.78

HIGH ACCIDENT LOCATION LIST
1994 - 1997

INTERSECTION	TOTAL CRASHES	# of FATAL CRASHES	# OF INJURY CRASHES	# OF PROPERTY DAMAGE ONLY	CRASHES BY YEAR				TRAFFIC VOLUME	CRASH RATE
					1994	1995	1996	1997		
NE KILLINGSWORTH ST at MARTIN LUTHER KING JR	38	0	23	15	7	12	12	7	35801	0.78
NE LOMBARD ST at MARTIN LUTHER KING JR	40	0	18	22	17	10	9	4	37803	0.78
SW BARBUR BLVD at CAPITOL HWY	48	0	22	26	8	10	16	14	45391	0.78
N AINSWORTH ST at INTERSTATE AVE	23	0	13	10	5	5	6	7	21817	0.78
NE FREMONT ST at 33RD AVE	28	0	11	17	8	5	6	9	26585	0.77
NW EVERETT ST at 16TH AVE / I-405 SB ON-RAMP	32	0	12	20	14	2	11	5	30506	0.77
SE BELMONT ST at 20TH AVE	22	0	14	8	1	5	5	11	21062	0.77
SE DIVISION ST at 11TH AVE	25	0	10	15	9	8	5	3	23999	0.77
SE TACOMA ST at MCLOUGHLIN BLVD	66	0	32	34	13	23	12	18	63393	0.77
NE SANDY BLVD at 33RD/MULTNOMAH/PEERLESS (4030 ZN 3-5)	34	0	18	16	8	10	8	8	32878	0.76
SE BELMONT ST at GRAND AVE	69	1	34	34	19	10	17	23	67564	0.75
NE DEKUM ST at MARTIN LUTHER KING JR	22	1	14	7	4	5	7	6	21862	0.74
N WEIDLER ST at WILLIAMS AVE	28	0	5	23	4	6	13	5	28082	0.73
SE POWELL BLVD at I-205 NB EXTO POWELL	50	0	21	29	19	10	9	12	50417	0.73
W BURNSIDE ST at 19TH AVE	31	0	13	18	6	9	9	7	31480	0.72
SE HAWTHORNE BLVD at 7TH AVE	20	0	8	12	8	2	4	6	20332	0.72
N ALBERTA ST at INTERSTATE AVE	20	0	8	12	4	5	6	5	20384	0.72
NE HALSEY ST at 148TH AVE	25	0	16	9	16	2	1	6	25510	0.72
NE FREMONT ST at MARTIN LUTHER KING JR	32	0	20	12	8	9	5	10	32656	0.72
SE CLAY ST at GRAND AVE	36	0	15	21	8	9	11	8	36845	0.72
NW GLISAN ST at 14TH AVE	22	0	9	13	6	7	4	5	22523	0.72
N PORTLAND BLVD at GREELEY AVE	24	0	13	11	3	7	10	4	24725	0.71
N LOMBARD ST at ST LOUIS AVE	22	0	9	13	5	4	8	5	22677	0.71
N LOMBARD ST at DENVER AVE	25	0	11	14	4	7	6	8	25805	0.71
SE DIVISION ST at 71ST AVE	21	0	11	10	6	6	3	6	21821	0.71
SE HOLGATE BLVD at 52ND AVE	22	0	10	12	11	6	1	4	22862	0.71
SE WOODSTOCK BLVD at 92ND AVE	31	0	16	15	9	8	8	6	32319	0.71
SW CLAY ST at FRONT AVE	47	0	14	33	7	13	12	15	49819	0.69
NE ALBERTA ST at MARTIN LUTHER KING JR	33	0	17	16	7	10	8	8	35096	0.69
SW MARKET ST at 13TH AVE	22	0	12	10	7	4	4	7	23474	0.69
NE SANDY BLVD at 31ST AVE	21	0	6	15	6	4	8	3	22606	0.68

HIGH ACCIDENT LOCATION LIST
1994 - 1997

INTERSECTION	TOTAL CRASHES	# of FATAL CRASHES	# OF INJURY CRASHES	# OF PROPERTY DAMAGE ONLY	CRASHES BY YEAR				TRAFFIC VOLUME	CRASH RATE
					1994	1995	1996	1997		
SE HOLGATE BLVD at 92ND AVE	21	0	9	12	9	9	2	1	22776	0.68
SE FOSTER RD at 82ND AVE	52	1	23	28	10	11	14	17	56600	0.68
SE HAWTHORNE BLVD at 39TH AVE	39	0	19	20	11	11	6	11	42804	0.67
SW ALDER ST at 2ND AVE	20	0	5	15	7	3	7	3	21967	0.67
NE SAN RAFAEL ST at 122ND AVE	24	0	13	11	4	7	4	9	26373	0.67
NE MULTNOMAH ST at GRAND AVE	23	0	12	11	4	6	5	8	25507	0.66
NE LLOYD BLVD at GRAND AVE	25	0	12	13	4	9	7	5	27982	0.66
NE SANDY BLVD at 82ND AVE	28	0	18	10	5	11	5	7	31447	0.65
SE DIVISION ST at 148TH AVE	32	0	17	15	10	4	13	5	35965	0.65
NE SCHUYLER ST at 33RD AVE	22	0	10	12	7	5	6	4	24930	0.65
SE FRANCIS ST at 39TH AVE	20	0	12	8	4	9	4	3	22796	0.65
W BURNSIDE ST at 3RD AVE	39	0	20	19	14	12	3	10	44778	0.64
N CENTER ST at I-5 SB EXTO JANTZEN	24	1	7	16	3	4	9	8	27573	0.64
NE BROADWAY at MARTIN LUTHER KING JR	44	0	26	18	11	14	12	7	50672	0.64
NE HALSEY ST at 122ND AVE	43	0	20	23	5	12	15	11	49618	0.64
NE SANDY BLVD at 37TH AVE / HALSEY ST	27	0	12	15	7	7	5	8	31188	0.64
NE BROADWAY at 9TH AVE	23	0	14	9	2	5	7	9	26668	0.63
SE STARK ST at 103RD DR	23	0	10	13	3	6	7	7	26778	0.63
E BURNSIDE ST at 82ND AVE	33	0	19	14	4	8	10	11	38447	0.63
NE BROADWAY at 10TH AVE	21	0	12	9	5	6	6	4	24544	0.63
N LOMBARD ST at PENINSULAR AVE (1919)/ VILLARD AVE (2515)	21	0	14	7	6	7	4	4	24711	0.62
SE STARK ST at 122ND AVE	44	0	20	24	9	8	10	17	51960	0.62
SE FOSTER RD at 52ND AVE	22	0	10	12	5	6	4	7	25992	0.62
SE POWELL BLVD at 112TH AVE	21	0	13	8	2	3	10	6	24940	0.62
NE MULTNOMAH ST at 21ST AVE	20	0	10	10	6	3	4	7	23799	0.62
SE HAWTHORNE BLVD at GRAND AVE	34	0	18	16	7	10	7	10	40646	0.62
N LOMBARD ST at VANCOUVER AVE	25	0	13	12	5	8	8	4	30113	0.61
SE DIVISION at I-205 NB OFF-RAMP/96TH AVE	34	0	17	17	10	9	8	7	41026	0.61
E BURNSIDE ST at 20TH AVE	23	0	6	17	7	6	6	4	27829	0.61
SE DIVISION ST at 92ND AVE	23	0	12	11	4	6	10	3	27860	0.61
SE FOSTER RD at 67TH AVE	20	0	13	7	5	3	6	6	24346	0.60

HIGH ACCIDENT LOCATION LIST
1994 - 1997

INTERSECTION	TOTAL CRASHES	# of FATAL CRASHES	# OF INJURY CRASHES	# OF PROPERTY DAMAGE ONLY	CRASHES BY YEAR				TRAFFIC VOLUME	CRASH RATE
					1994	1995	1996	1997		
SE DIVISION ST at 82ND AVE	41	0	24	17	7	10	11	13	50028	0.60
SE MAIN ST at MARTIN LUTHER KING JR	26	0	10	16	4	6	9	7	31782	0.60
NE WEIDLER ST at 21ST AVE	20	0	11	9	5	2	4	9	24621	0.60
SE DIVISION ST at 122ND AVE	45	0	24	21	13	13	11	8	55466	0.60
SE POWELL BLVD at 174TH AVE	21	0	12	9	3	4	3	11	25916	0.60
SE POWELL BLVD at 39TH AVE	55	0	28	27	17	18	12	8	67900	0.60
NE BROADWAY at 15TH AVE	22	0	12	10	5	3	7	7	27193	0.59
NE GLISAN ST at 102ND AVE	39	0	20	19	8	11	10	10	48265	0.59
SE HOLGATE BLVD at 82ND AVE	33	0	22	11	8	7	9	9	41162	0.59
SE STARK ST at GRAND AVE	26	0	11	15	7	7	5	7	32471	0.59
NE HANCOCK ST at 33RD AVE	20	0	6	14	6	11	1	2	25008	0.59
SE HOLGATE BLVD at 28TH AVE	22	1	8	13	4	5	11	2	27778	0.58
N GOING ST at INTERSTATE AVE	32	1	13	18	6	11	11	4	40540	0.58
N LOMBARD ST at INTERSTATE AVE	33	1	22	10	13	5	10	5	41832	0.58
SE BELMONT ST at 7TH AVE	23	0	14	9	7	7	4	5	29162	0.58
SE WASHINGTON ST at 99TH AVE	24	0	10	14	3	10	3	8	30454	0.58
SE STARK ST at 139TH AVE	23	0	13	10	7	5	2	9	29319	0.58
SE STARK ST at 82ND AVE	31	0	19	12	7	10	10	4	39686	0.57
W BURNSIDE ST at 22ND AVE	22	0	9	13	4	2	6	10	28191	0.57
W BURNSIDE ST at 13TH AVE	32	0	12	20	1	10	11	10	41027	0.57
NE SANDY BLVD at 44TH AVE	21	0	11	10	9	2	4	6	26936	0.57
NE SANDY BLVD at 105TH AVE	21	0	14	7	3	8	5	5	26945	0.57
NE US GRANT PL at 33RD AVE	21	0	6	15	5	3	7	6	26946	0.57
SE POWELL BLVD at 162ND AVE	20	0	11	9	5	2	5	8	25796	0.57
SE STARK ST at 99TH AVE	21	0	12	9	6	4	6	5	27195	0.57
SW BEAV-HILLSDALE HWY at SHATTUCK RD	21	0	6	15	7	3	5	6	27330	0.56
NE EVERETT ST/I-84 EB ON-RAMP at GRAND AVE	29	0	6	23	23	4	1	1	37983	0.56
NE WEIDLER ST at 3RD AVE	23	0	12	11	4	8	7	4	30281	0.56
E BURNSIDE ST at 6TH AVE	26	0	13	13	9	5	5	7	34289	0.56
SE TAYLOR ST at MARTIN LUTHER KING JR	28	0	12	16	8	11	3	6	36992	0.56
SE MCLOUGHLIN BLVD at 17TH AVE	44	1	24	19	9	12	11	12	58262	0.56
NE HASSALO ST at 39TH AVE	20	0	11	9	5	8	3	4	26502	0.55

HIGH ACCIDENT LOCATION LIST
1994 - 1997

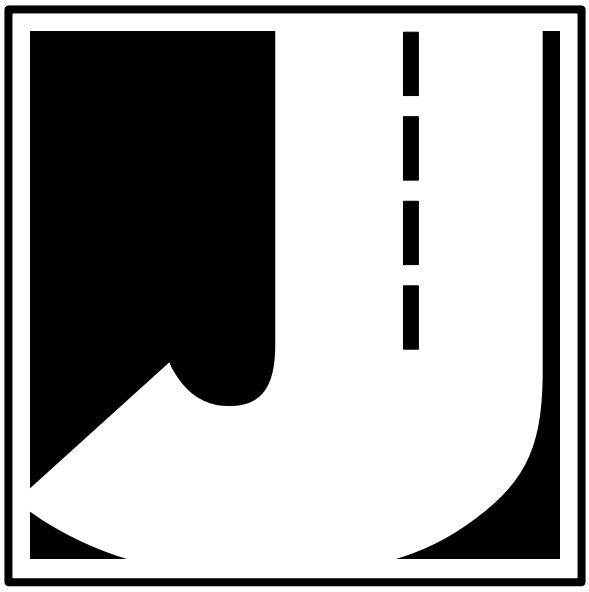
INTERSECTION	TOTAL CRASHES	# of FATAL CRASHES	# OF INJURY CRASHES	# OF PROPERTY DAMAGE ONLY	CRASHES BY YEAR				TRAFFIC VOLUME	CRASH RATE
					1994	1995	1996	1997		
SW TAYLORS FERRY RD at BARBUR BLVD	21	0	12	9	6	3	4	8	27910	0.55
SW BARBUR BLVD at 22ND AVE	20	0	8	12	7	9	1	3	26890	0.55
NE COLUMBIA BL at MARTIN LUTHER KING JR	29	0	11	18	8	4	11	6	39060	0.55
SW MARKET ST at FRONT AVE	31	0	15	16	5	8	6	12	41899	0.54
NE AINSWORTH ST at MARTIN LUTHER KING JR	24	0	15	9	9	3	6	6	32443	0.54
NW NICOLAI ST at YEON AVE	34	2	13	19	7	8	11	8	46048	0.54
NE BROADWAY at VICTORIA AVE	31	0	8	23	5	10	5	11	42019	0.54
SE WASHINGTON ST at I-205 SB ENFR WASH-S	22	0	13	9	6	4	8	4	30029	0.54
SE WASHINGTON ST at 82ND AVE	28	0	21	7	10	6	6	6	38244	0.54
NE GLISAN ST at 60TH AVE	22	0	8	14	4	4	9	5	30247	0.53
SE MORRISON ST at GRAND AVE	38	0	17	21	11	12	7	8	52525	0.53
NE SANDY BLVD at 20TH AVE / FLANDERS ST	24	0	13	11	4	7	4	9	33536	0.53
NE SISKIYOU ST at 122ND AVE	21	0	17	4	6	6	4	5	29372	0.53
NE BROADWAY at 21ST AVE	20	0	10	10	6	5	4	5	28195	0.52
N COLUMBIA BLVD at VANCOUVER AVE	23	0	14	9	7	3	8	5	32428	0.52
NE WEIDLER ST at 2ND AVE	22	0	11	11	5	5	10	2	31131	0.52
SE WOODSTOCK BLVD at 82ND AVE	25	0	13	12	7	5	7	6	35394	0.52
SE DIVISION ST at 130TH AVE	25	0	18	7	10	5	7	3	35520	0.52
SW BARBUR BLVD at 64TH AVE	35	0	22	13	9	9	7	10	49796	0.52
NE GLISAN ST at I-205 SB EXTO GLISAN	33	0	25	8	13	8	2	10	47357	0.51
NE SANDY BLVD at 42ND AVE	24	0	14	10	8	5	5	6	34522	0.51
SE FOSTER RD at 172ND AVE	20	1	8	11	2	4	4	10	29349	0.50
NE COLUMBIA BLVD at SANDY/COLUMBIA BL LI	31	0	18	13	7	10	7	7	47026	0.48
SE HOLGATE BLVD at MCLOUGHLIN BLVD	46	0	30	16	9	10	17	10	70291	0.48
NE AIRPORT WAY at 122ND AVE	29	0	13	16	4	9	9	7	44377	0.48
SE MILL ST at GRAND AVE	20	0	9	11	8	4	3	5	31076	0.47
NE BROADWAY at 33RD AVE	27	1	17	9	12	5	5	5	42157	0.47
NE GLISAN ST at 122ND AVE	30	0	17	13	6	7	12	5	47034	0.47
SE POWELL BLVD at 10TH AVE	30	0	18	12	8	7	9	6	47605	0.46
W BURNSIDE ST at 21ST AVE	23	0	12	11	7	5	2	9	36968	0.46
SE POWELL BLVD at 92ND AVE	29	0	17	12	6	4	12	7	46820	0.46
W BURNSIDE ST at 9TH AVE	25	0	7	18	10	6	4	5	40753	0.45

HIGH ACCIDENT LOCATION LIST
1994 - 1997

INTERSECTION	TOTAL CRASHES	# of FATAL CRASHES	# OF INJURY CRASHES	# OF PROPERTY DAMAGE ONLY	CRASHES BY YEAR				TRAFFIC VOLUME	CRASH RATE
					1994	1995	1996	1997		
E BURNSIDE ST at MARTIN LUTHER KING JR	39	0	12	27	9	8	9	13	64028	0.45
E BURNSIDE ST at 122ND AVE	24	0	13	11	5	5	9	5	40212	0.44
NE FREMONT ST at 122ND AVE	22	0	10	12	5	7	6	4	37212	0.43
W BURNSIDE ST at 2ND AVE	28	0	14	14	8	6	7	7	47939	0.43
SE POWELL BLVD at 21ST AVE	26	0	15	11	8	4	3	11	46366	0.41
SE DIVISION ST at 112TH AVE	25	0	16	9	8	7	5	5	45037	0.41
SE POWELL BLVD at 33RD AVE	20	0	9	11	4	6	4	6	36586	0.40
SW TAYLORS FERRY RD at MACADAM AVE	24	0	11	13	2	8	5	9	45075	0.39
W BURNSIDE ST at BROADWAY	24	0	10	14	5	6	5	8	45335	0.39
SE POWELL BLVD at 26TH AVE	24	0	13	11	6	7	6	5	48297	0.37
NE AIRPORT WAY at I-205 NB ENFR AIRPOR	21	0	10	11	7	3	8	3	44010	0.35
SE POWELL BLVD at 12TH AVE / 13TH PL	27	0	20	7	5	7	10	5	56643	0.35
SE POWELL BLVD at 42ND AVE / 43RD AVE	20	0	12	8	3	7	4	6	43154	0.34
SE POWELL BLVD at MILWAUKIE AVE	29	0	18	11	11	4	5	9	66428	0.32
SW ARTHUR ST at ROSS ISLAND WY	22	0	2	20	8	4	5	5	52612	0.31
NE AIRPORT WAY at 82ND AVE	25	1	12	12	5	3	8	9	60135	0.31
NE COLUMBIA BLVD at I-205 SB RAMPS (9753&9754)	23	0	13	10	10	3	6	4	56714	0.30
SE WOODWARD ST at MCLOUGHLIN BLVD	25	0	6	19	6	6	6	7	62393	0.29

PC-TRAVEL for Windows®

Travel Time and Delay Analysis Software



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If you have any questions about the use of PC-Travel, please call the following number:

877-603-5844

Monday – Friday 8:00 AM to 4:30 PM Eastern time

You may also contact us by fax at:

1-215-491-4889

or via e-mail at:

support@jamartech.com

For more information on our products, the latest news in product development, and to download software updates, visit our web site at:

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Table of Contents

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Chapter 1

Introduction and Installation

Introduction & Definitions

Welcome to PC-Travel for Windows, a JAMAR Technologies software program designed to process travel time and delay data. Travel time and delay analysis is a complicated subject and we have not tried to oversimplify it at the expense of the experienced user who wants to get as much from the analysis as possible; yet we have tried to make the software easy to use, even for the occasional user.

This Reference Manual is for PC-Travel for Windows version 1, which among other things assumes that all travel time data is collected using a JAMAR TDC-8 count board connected to a transmission sensor installed in a test vehicle. Other data collection options may be added at a later date.

This guide currently is divided into three parts:

The first part covers some of the basics of doing travel time studies and the definition of terms used in collecting the data and running the software. This part also shows you how to install and run the software on your computer.

The second part is a series of tutorials that provide step-by-step instructions on how to use the software. The first tutorial is a general introduction to the software. Subsequent tutorials go into more detail about specific parts of the program.

The third and last part is a series of appendices that have reference-type information that you may find useful if you are interested in the technical aspects of the software.

Computer Requirements

- Windows 95, 98, NT, 2000 or ME.
- 64 Megabytes of RAM (although it probably will run in less).
- 10 Megabytes of free space on your hard disk.
- CD-ROM (to install the software only)
- Screen resolution of 800 x 600 or better.

This last requirement is the only non-standard one. Some users may still be using older computers limited to 640 x 480 pixels. If you find the software screens don't fit on the monitor, this may be the case for your computer. You should be able to change the screen resolution to 800 x 600. Worst case would be to add a new video card to your computer for $50 or so (if you are running Windows at 640 x 480 this is a great investment).

Software Updates

Updated versions of JAMAR software are released periodically and are posted on the JAMAR web site. Licensed owners of PC-Travel for Windows can download updates to the program to make sure they always have the latest version of the software on their computer. To download the latest version of PC-Travel for Windows, go to **www.jamartech.com** and then select Downloads from the list of options.

Definitions

Before any discussion of travel time data collection and analysis can begin, you must have a careful understanding of the terms we use and how we use them. This section defines the words used in the program that mean something more specific than the word itself might imply.

Run

A single collection of travel time data.
For example, when data is collected along an arterial, the user drives to the beginning of the arterial under study, starts data collection, proceeds along the arterial to the end of the study area, and then stops data collection. He has just completed one run. If he turns around and collects data in the other direction, it is another run. All runs are stored as separate entities in the program.

Study

A collection of runs.
When the user collects data, he is making data runs, and when he gets back to the office, he collects those runs into studies. The difference is important because runs can be collected into different studies. For example, a user may make a number of runs at an arterial during one or two days. Back in the office he may create a study with just the morning runs. He may also create a study with all of the runs, which of course use some of the morning runs.

There is one critical rule for studies:
All of the runs in a study must start at the same place, end at the same place, and follow the same route.

Only runs in the same direction can be part of the same study. Since you usually collect runs in two directions (up and back), you typically will create at least two studies for each data collection session.

Study Group

A folder where related runs and studies are stored.
This term is specific to the program. Since studies must be created from runs that start in the same place, end in the same place, and go in the same direction, it makes sense to store all runs that fit that criteria in one place on your computer, along with any studies that are created from those runs.

You typically create Study Groups when you first read the run data collected in the field using a TDC-8 count board. Since you usually collect at least two sets of runs, one in one direction and another in the opposite direction, you usually will create two Study Groups when you read the data from the TDC-8.

Fixed-Route

Data collection along a pre-determined route.
Version 1 of PC-Travel for Windows only supports Fixed-Route studies. Another type of study, called Chase Car studies, may be supported in the future, based on user interest.

When you do Fixed-route studies, you collect run data along the same route several times. One run is rarely sufficient to find the travel time characteristics of a route. You may be lucky and never hit a red light during your run, or you may be unlucky and hit several. If you collect several runs, the averages of the individual run data will be a better representative of the true traffic characteristics of the route.

Fixed-route studies usually have segments defined at the time the runs are made. The route is divided into geographic segments, using easily determined landmarks to separate the segments. For arterials, the segment boundaries may be signalized intersections. For freeways, the boundaries may be interchanges. You are free to define the segments any way you want.

Node

The boundary between two segments of a run.

Every run has a *starting node*, which is where you start collecting data on a fixed-route study, an *ending node*, which is where you stop collecting data, and several *segment nodes* in between. The user records the location of the nodes by pressing buttons on the TDC-8 as the user passes the nodes during a run.

Primary Run

A run where the user collected segment node data.

Most users, when doing a run, will collect segment node data by pressing the New Link button on the TDC-8 as they pass by the pre-determined nodes in the route. There is a fairly high error associated with this process (more about this later) so the distances measured for a single run are not very accurate. The program uses the average of the node distances from each of the Primary runs in a study to find more accurate distances between nodes.

Secondary Run

A run where the user did not collect segment node data.
or
A primary run in which the user decides not to use the segment node data to find the node distances for the study.

You do not have to collect segment node data while doing a run. You may have done several runs in that direction and know you have sufficient data to find accurate node distances, or you may have made several mistakes marking the node on a particular run (which is annoyingly easy to do), or you simply don't need node by node statistics for this route. You can define a run as Secondary in the software and any node distance data in the run will be ignored in the analysis.

Before and After

A way to categorize a group of runs so that two different groups of runs can be compared.

The terms Before and After are used liberally in the program and these mean only that the data is summarized into two separate groups so the statistics of each group can be compared. If all of one set of runs are made under the same conditions, they may all be defined as *before* runs. Later, identical runs made under different conditions (after an arterial has been re-timed, for example) may be defined as *after* runs. The program lets you define runs as either before or after and then automatically calculates statistics for the before runs as a group, the after runs as a group, and changes in the various statistics from before to after.

Normal Speed

Ideal speed at which the traffic should travel on an arterial.

The Normal Speed is used in two places in the program. It is used to find Total Delay statistics for runs and studies *(see Total Delay, below)*. It also is plotted on the Time/Space Diagrams to show perfect progression. You set the Normal Speed on the Study Summary screen. As with most ideals, real traffic rarely measures up to the ideal, but it is useful as a guide.

Travel Time

The elapsed time to travel between two points, in seconds.

This is probably the most fundamental of the reported statistics. It is measured directly by the TDC-8 in the field. All run travel times are measured and reported to the nearest second. Study travel times, which are averages of the run travel times, are reported in tenths of second (technically speaking, the tenths of second are not significant in studies with less than about 5 runs, but that is rarely of concern in the vast majority of practical traffic evaluation situations).

Number of Stops

A stop is defined as a one-second interval where the speed is less than X MPH for one second when the speed was greater than X MPH in the previous second.

X is normally 5 MPH but can be set to any speed you want. This speed is called the Stop Speed and is set on the Study Summary screen. Each time the vehicle slows down and crosses the Stop Speed boundary, a stop is counted. The vehicle must speed up faster than the threshold before another stop can be counted.

Average Speed

The total distance covered divided by the elapsed time.

The program calculates the average speed for each section *(node to node distance)* and also separately calculates a total average speed for the entire route.

Total Delay

Difference between actual travel time and ideal travel time.

Actual travel time is calculated from the data. The ideal travel time is based on the Normal Speed setting on the Study Summary screen.

Time <= X MPH

Total time the vehicle spent at or below the given speed.

The program gives you three speed categories, which you can set for different purposes. You can measure stopped delay (time vehicle is stopped) by setting Category 1 to 0 MPH. You can measure queue delay by setting Category 2 to 7 MPH. The third category might be set to 30 MPH to show how much time vehicles spent in car following mode rather than free flow (assuming free flow speed is 40 or 45 MPH). Many other uses for these three categories are possible, limited only by your imagination.

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Chapter 2

How to Install & Run PC-Travel for Windows

How to Install & Run PC-Travel for Windows

Installation Procedure

The install program should load and run when you insert the CD into your CD-ROM drive. If your system is set up with the "Auto Run CD" feature turned off, you need to run the Setup.exe program that is on the CD. Click on the **Start** button on your Windows desktop. Select **Run** from the list of options and type the command line **X:\setup.exe**, where X is the letter of your CD-ROM drive. Press **Ok** and the installation will begin.

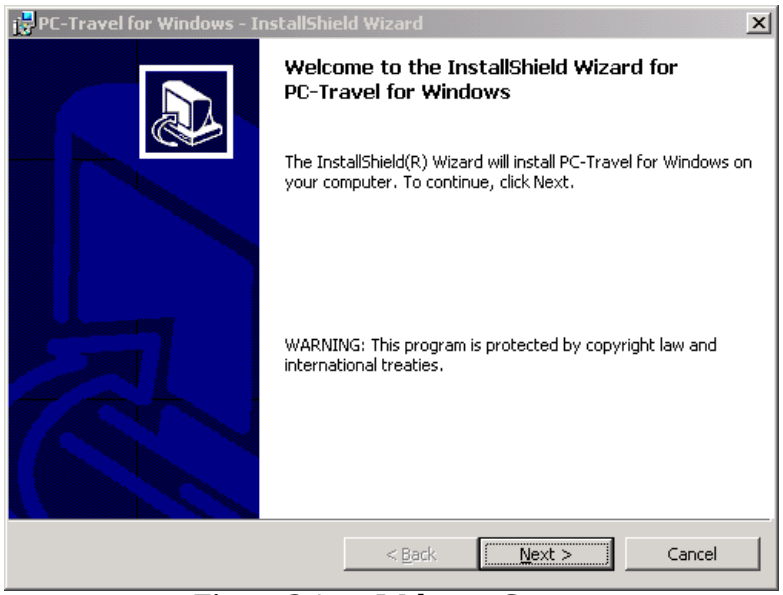

Figure 2.1 — Welcome Screen

The Welcome screen reminds you to be sure all other programs are closed before proceeding with the installation. During the installation, files used by the program will be copied to your computer, including some Windows system files. If other programs are open and using some of the files that need to be installed, an error can occur. Make sure you close any programs that obviously are running (especially virus checkers) before you install this or any Windows-based software.

The next screen contains the license information for the program. Please read this information. You must accept the provisions of the license in order to proceed and use the program. The program's license allows you to install the program on multiple computers provided they are in the same location and being used by employees of the entity that purchased the license. This is a very liberal license — many program licenses do not allow you to install the program on more than one computer. We ask that you respect the licensing policy and not abuse the use of this program. If you agree to the license, click Yes to continue.

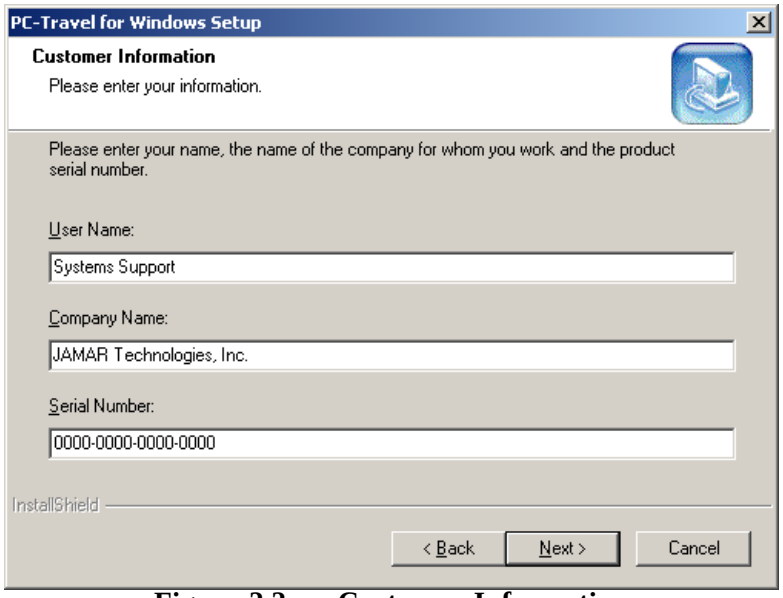

Figure 2.2 — Customer Information

The next screen asks for the User Name, Company Name and Serial Number. The serial number can be found on the back of your CD case. When entering the numbers be sure to include the dashes. If the serial number is entered incorrectly, you will not be allowed to proceed with the installation. Once the information has been entered, click the Next button to continue.

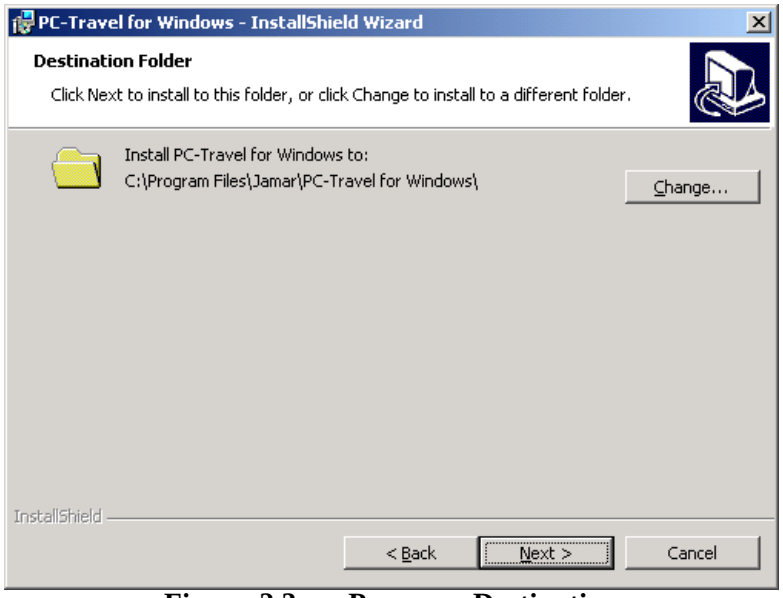

Figure 2.3 — Program Destination

The Choose Destination Location screen is used to select the folder where PC-Travel for Windows will be installed. The default folder is C:\Program Files\JAMAR\PC-Travel for Windows, but you can change this if you like. Click the Browse button and navigate to the folder you want. Once the directory listed is correct, click Next to continue.

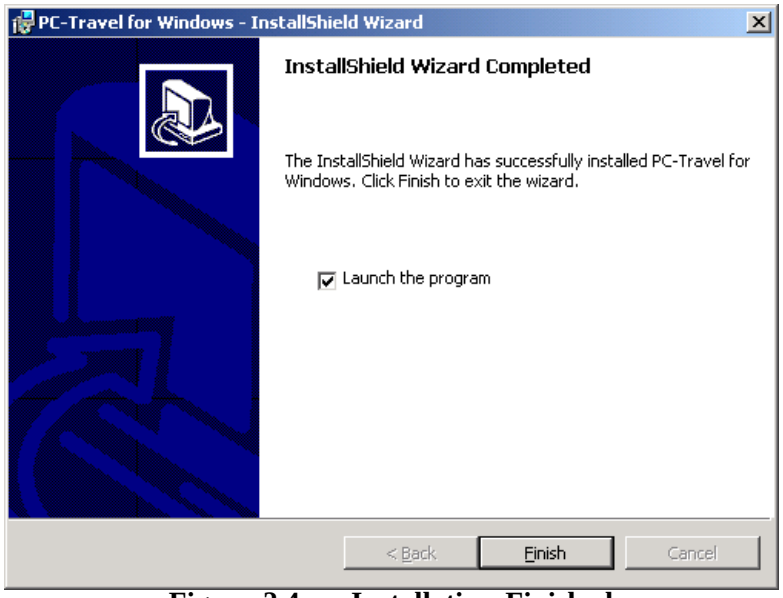

Figure 2.4 — Installation Finished

Once the installation program has enough information, the files will be copied from the CD to your computer. You'll then see a screen that tells you the installation has completed. You may be asked if you want to re-start your computer now. If you get this message, you should re-start your computer before you try to run the program. This will allow any of the System files that were copied during the installation to be loaded properly.

How to Run PC-Travel for Windows

Like most Windows programs, there are several ways you can run the software. Here are two:

1) Open an Explorer window (right click on My Computer and select Explore) and find the PC-Travel for Windows.exe file, which probably is in the *C:\Program Files\JAMAR\PC-Travel for Windows* folder. You will see a screen that looks something like figure 2.5 shown below. Double click on the file **PC-Travel for Windows.exe** and the program will run.

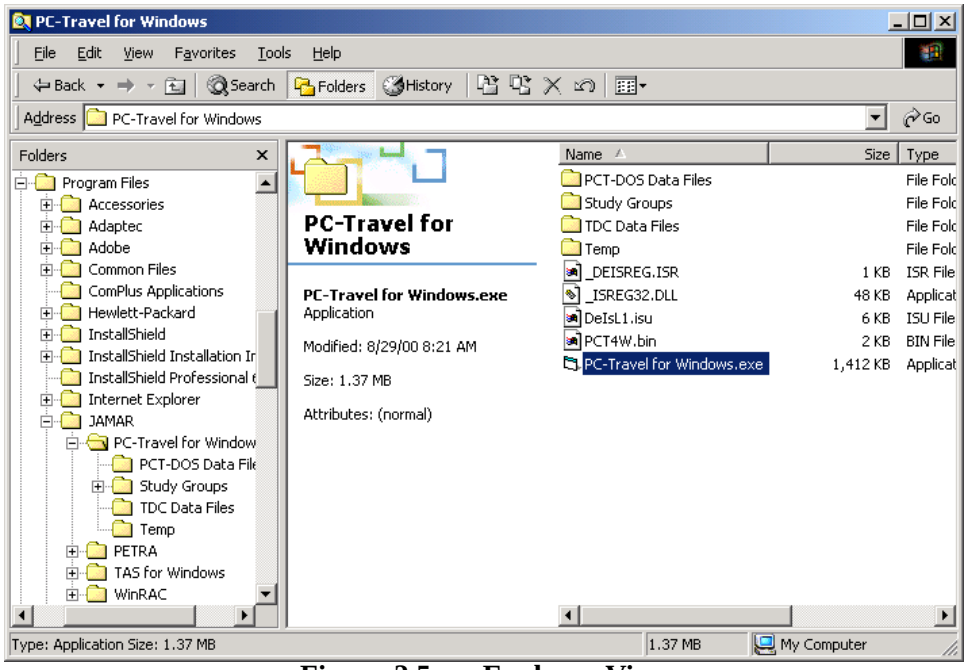

Figure 2.5 — Explorer View

2) Select **Start**, **Programs**, and then **JAMAR** from the list of programs. There could be a long list, and they may not be in alphabetical order (don't you love Windows?). You will see a display similar to the one shown here. Select **PC-Travel for Windows** then click on the second **PC-Travel for Windows**. This will run the software.

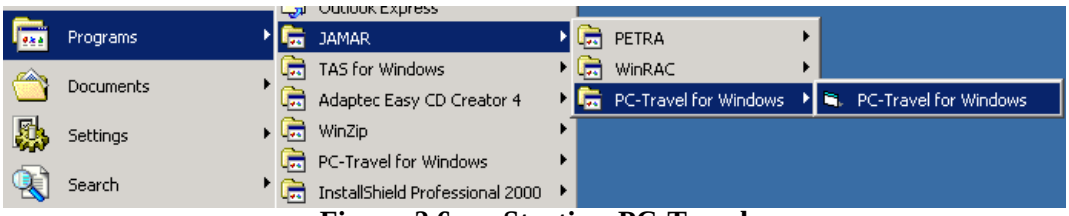

Figure 2.6 — Starting PC Travel

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Tutorial 1

Introduction to PC-Travel for Windows

Introduction to PC-Travel for Windows

This tutorial will guide you through the basics of the software. To simplify things we will retrieve an existing study that was installed when the rest of the program was installed.

> *Note: The first time anyone runs PC-Travel for Windows after installing it, the software loads the Preferences screens so that the various settings can be checked and edited. From then on, the program starts with the Startup Options screen. This tutorial will start with the Preferences screen, assuming that you just installed the program. You may skip this section if it doesn't apply to you.*

Run the program (see the end of the Installation notes for two ways to start the software). The first screen you will see is a little message box that tells you that since this is the first time you have run the program, you need to check the settings. Click **Ok.**

You will then see the Preferences screen:

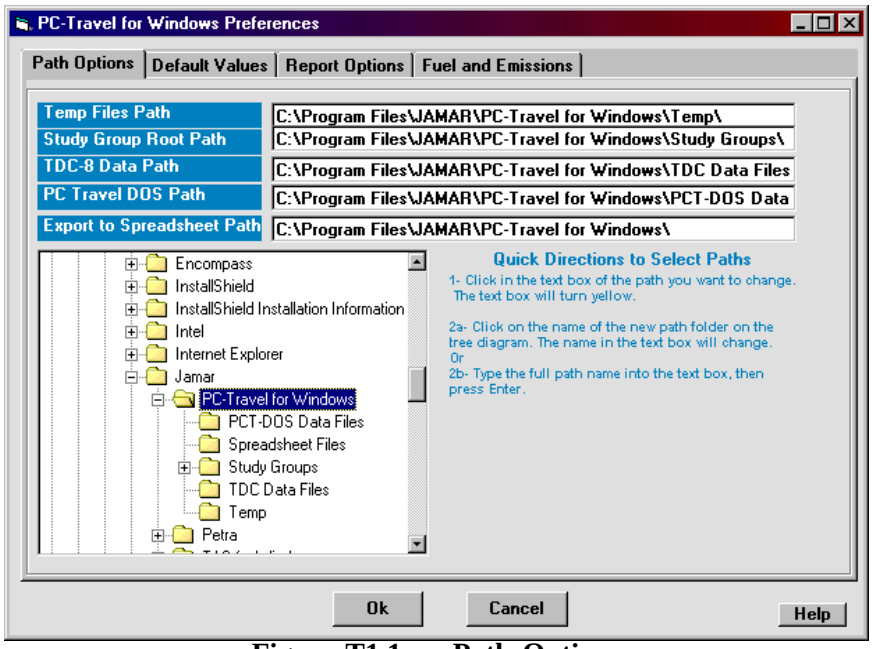


Figure T1.1 — Path Options

The Preferences screen has four sub-screens, selected by clicking on the tabs at the top of the window: ***Path Options***, ***Default Values***, ***Report Options***, and ***Fuel and Emissions***. The first tab, Path Options, is shown first.

If you selected the default installation directory, then you will see the same paths shown in the screen shot above. The program uses five basic directories:

1 – Temp
This directory holds the run files that you read from the TDC-8. These files are normally renamed and moved to a different directory, as you'll see when we get to the Read section.

2 – Study Group Root
This is the base directory where all of the travel time run and study data is stored. ***A Study Group is a***

collection of related runs and studies that are stored together. For the computer savvy, each Study Group is a directory under the Study Group Root directory.

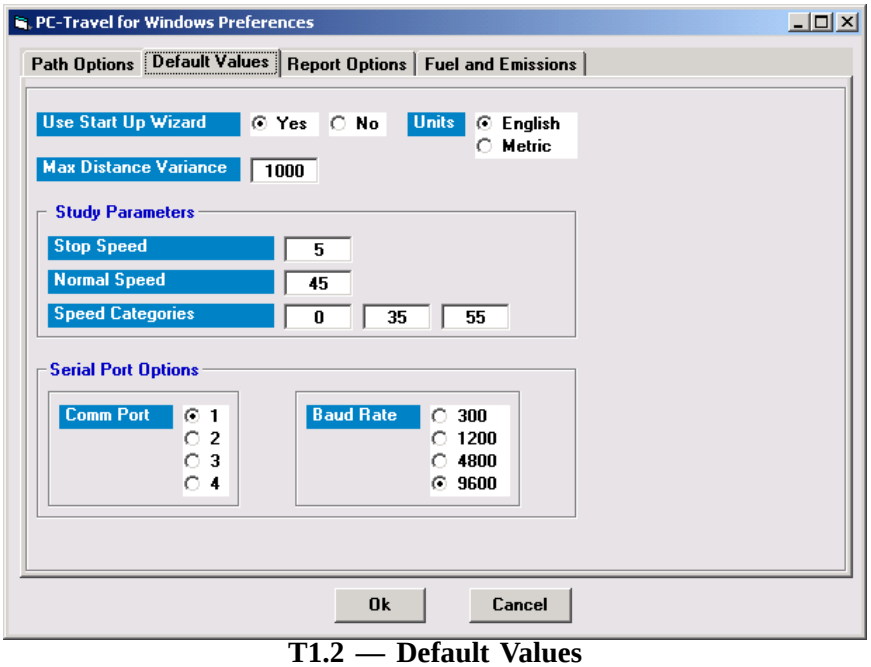
3 – TDC-8 Data Path
This is the directory where the data from the TDC-8 is stored before it is processed into runs.

4 – PC-Travel DOS Path
This is the directory where you have your old PC-Travel for DOS data files. The program can convert these files into new runs and studies. The installation program creates a directory under the PC-Travel for Windows directory and installs one set of old files that you can use to see how the Convert operation works.

5 – Export to Spreadsheet Path
This is the directory where files will be created if you use the Export to Spreadsheet function. Refer to *Tutorial 8 — How to Export Study & Run Statistics* to a Spreadsheet for more information.

If you want to change the paths, then follow the Quick Directions on the screen. You probably won't need to change them, however.

Click on the second tab labeled **Default Values**.



T1.2 — Default Values

The items on the screen are parameters that are used in the software. These values are the default values that are used when a study is first created; however, you can change many of them on the Study Summary screen if needed, and the changes will be stored with the other study data. Normally, you will set these values once and then not worry about them again.

Some of the parameters have an obvious meaning. Some don't. Don't worry what the various parameters mean for now. They will make more sense later after you have seen some more of the program. Just accept the default values for now.

You can check the settings in the other two tabs. They are fairly obvious from the descriptions, but again, don't worry if it isn't obvious what a particular setting is for.

You can play with the various options on the Report Option tab when you get to the Report section of the tutorial. Don't change any of the numbers in the Fuel and Emissions tab unless you are an expert in the models used.

Press **Ok** to close the Preferences screen and go to the Startup Screen.

Startup Options

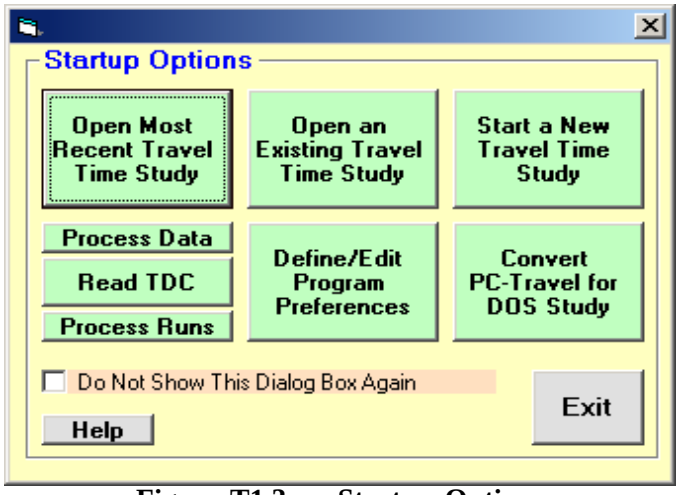


Figure T1.3 — Startup Options

This is the screen you will normally see when you first run the software. It helps to remind you what your options are when you first start the program. If you don't like this type of screen, you can turn it off so you won't see it in the future.

The options listed are fairly self-explanatory. However, they all will be discussed in more detail as we go along.

Click on the **Open an Existing Travel Time Study** button so we can start exploring PC-Travel for Windows.

Select Study

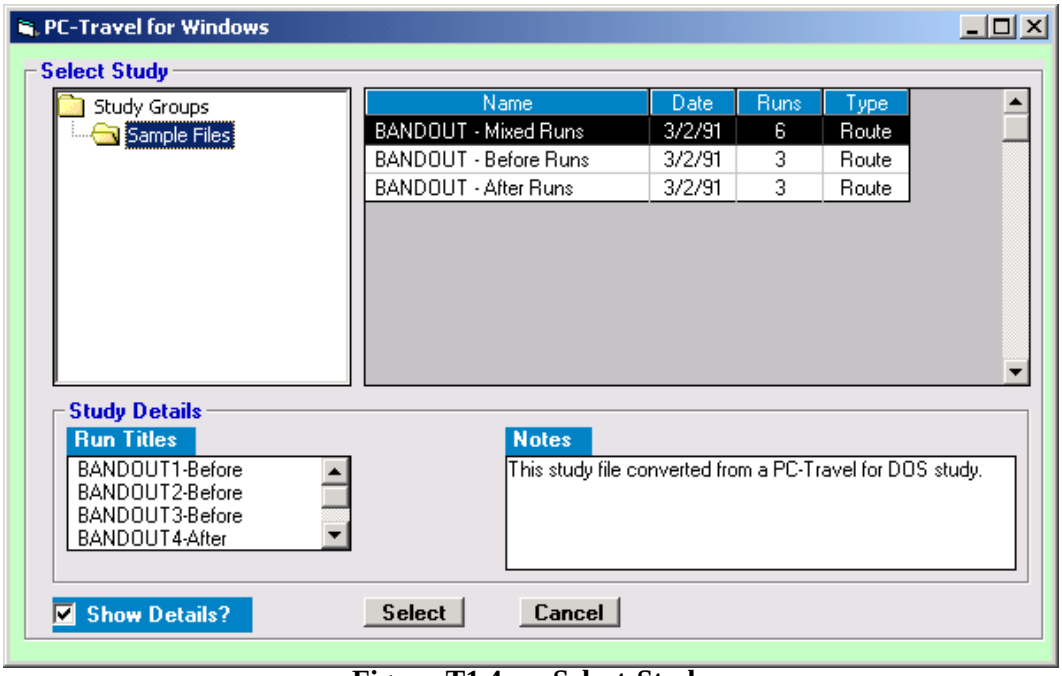


Figure T1.4 — Select Study

This is the screen you use to select a study that is stored on your computer. The upper left corner has a window that shows the directories *(or folders, if you prefer)* in the common tree format used in Windows. The Study Group folder is currently selected. Click on the **Samples** folder just below the **Study Group** folder. This is the state shown in figure T1.4 above.

The window to the right of the tree shows a list of the studies in that folder, with a little bit of information about the studies. In this case, there are three studies. The first study, **BANDOUT - Mixed Runs**, is highlighted.

The **Study Details** windows shows some more information about the highlighted study. The titles of the runs that make up that study are shown, as well as any notes you entered when you saved the study.

We want to open the first study, which is highlighted, so click on **Select**.

Study Summary

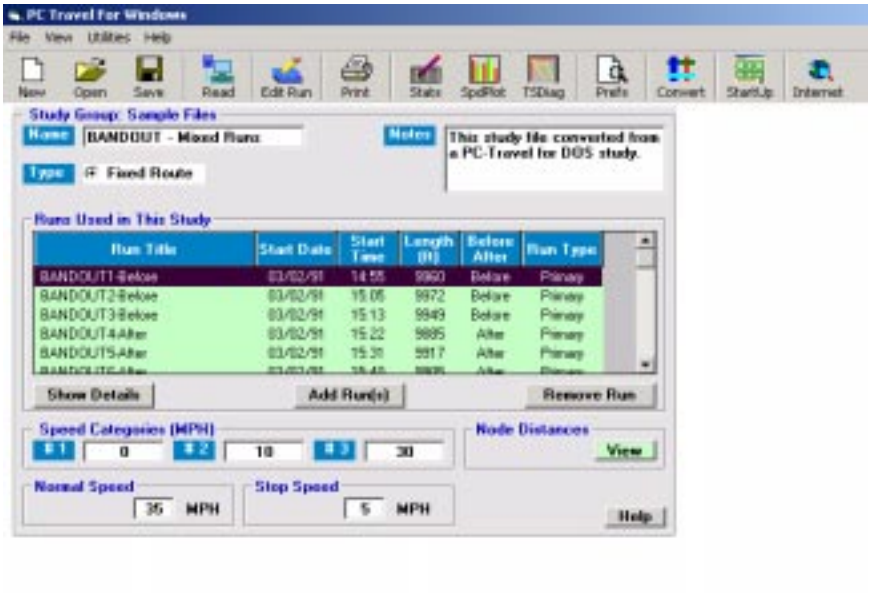


Figure T1.5 — Study Details

This is the core screen for the program; most of the operations involved in the software start and end here. There are several sections to this screen. At the top are the standard ***pull down menus*** that are part of every Windows program. Below that are a series of icons that make up the ***toolbar.*** These icons duplicate the most common options that are available in the menus.

The majority of the screen shows the details for the current study:

• The current **Study Group**. It is shown just below the toolbar. *(Sample Files, in this case).*

• The **Name** of the study. To change the name you type in a new name and then hit the **Save** icon on the toolbar, or select **File:Save Now** from the drop down menus.

• **Notes** for this study. Just type anything you want.

• Study **Type**, either Fixed Route or Chase Car. *(Chase Car studies aren't supported yet.)*

• List of **Runs Used in This Study**. You can **Add Runs** or **Remove Runs** using the appropriate buttons. You can also **Show Details** of any run *(we'll do that in a minute)*. All three buttons operate the same way; select the run then click the appropriate button.

• **Speed Categories #1, 2 & 3, Normal Speed,** and **Stop Speed**. These are all parameters that are used in the study statistics. If you have used PC-Travel for DOS these should be familiar. If not, then you'll see how they are used when you see the Study Statistics screens.

• **Node Distances**. This will be explained in depth in a little bit.

First, click the **Show Details** button. This will allow you to see all of the information about the run that is highlighted.

Run Details

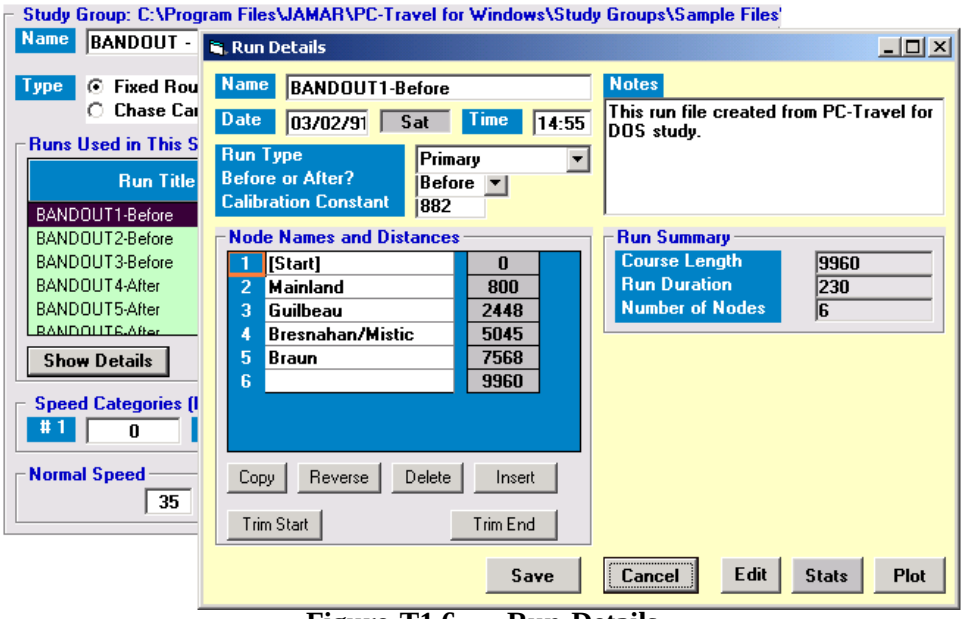


Figure T1.6 — Run Details

The Run Details screen shows just about everything we know about this particular run, and most of it can be edited. In general, any fields with a white background are edit fields, and can be changed. Fields with a gray background are calculated from other things, and can't be edited directly.

Most of the fields are self-explanatory; each run has a ***Name***, ***Date***, and ***Time***. A run can be either ***Primary or Secondary*** *(see page 1.4)*, and ***Before or After*** *(page 1.5)*. The ***Calibration Constant*** normally should not be edited; it is the factor that converts the pulse data collected in the TDC-8 to distances. You can also enter any ***Notes*** you want about this run. You might, for example, mention that it was raining during this run, or that there was a large truck in front of you during the run which might affect the data.

If the run is a Primary run you can edit the ***Node Names and Distances***. The Node Names have a white background, which means you can edit the names simply by typing over the existing name. The distances are derived from the data collected in the field; these aren't as easy to edit so they have a gray background.

You can ***Copy*** names and distances from other runs. You can ***Reverse*** the list of names *(usually after copying from another run that went in the other direction)*. And you can even ***Insert*** and ***Delete*** actual node data points in the data to fix a run. *(Inserting and Deleting data points is beyond the scope of this introductory tutorial and will be covered in another tutorial.)*

The name of the run is shown in the upper left corner text box. You can change the name and then click **Save** to create a new run. The run file is stored in the current Study Group.

You can see more information about the run, if needed.

Click **Stats**

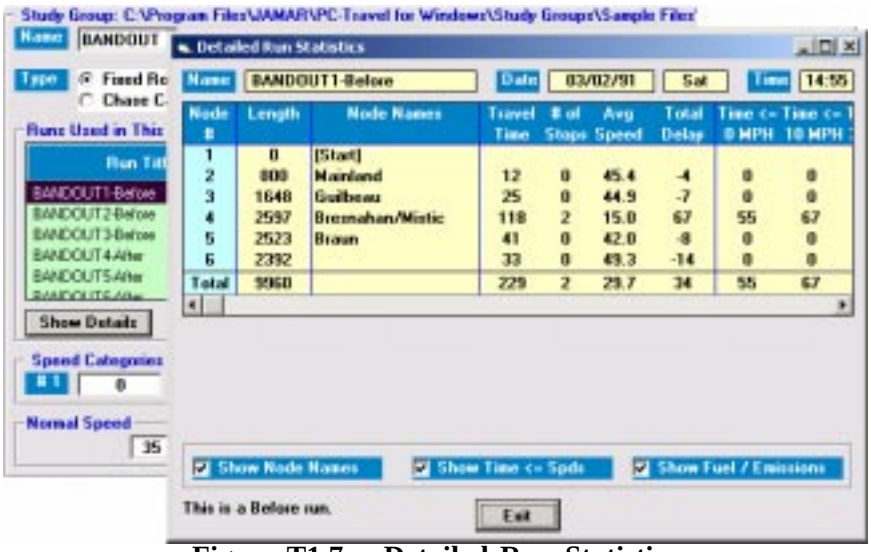


Figure T1.7— Detailed Run Statistics

This screen shows calculations of the standard statistics used in the program, for this run only. You can think of this as the results of a study with a single run. You can't edit anything on this screen. You can play with the check boxes and see what they do. If you are not familiar with all of the terms shown in the statistics, don't worry about it now. They will be explained later.

Click **Exit** to go back to the Run Details screen and then click on **Plot.**

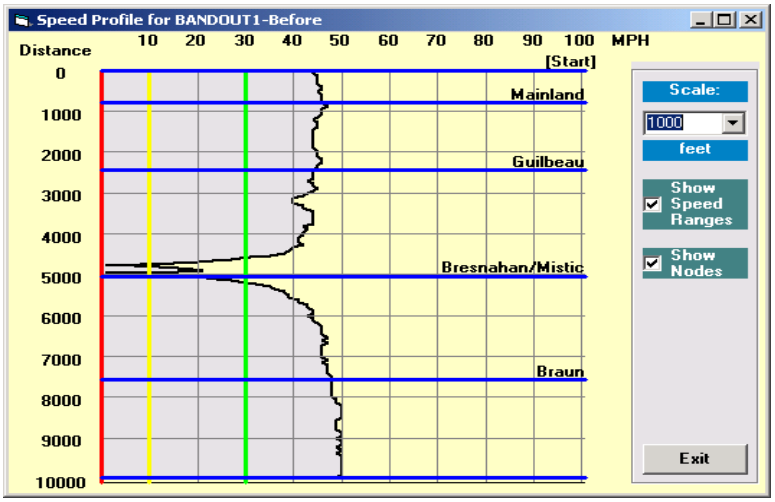


Figure T1.8— Speed Profile

You'll see the screen shown here. This is a plot of the Speed vs Distance for the data in the run. You can change the scale, and choose to show the nodes in the data, and to show the three speed category limits (the red line is Speed 1, Yellow is Speed 2, and Green is Speed 3).

In this run, the car went through a couple of intersections without any delays, then had to slow down to a stop *(probably a red light)*, and then accelerated back to about 50 mph for the duration of the run.

When you are done playing with the plot, click on **Exit** to return to the Run Details, then click **Cancel** to go back to the Study Summary screen.

Node Distances

At this point, you should be back at the Study Summary screen. Notice that the **View** button in the Node Distances frame is red. This is telling you that you need to check the Node Distances because something *may* be wrong. Click on **View**.

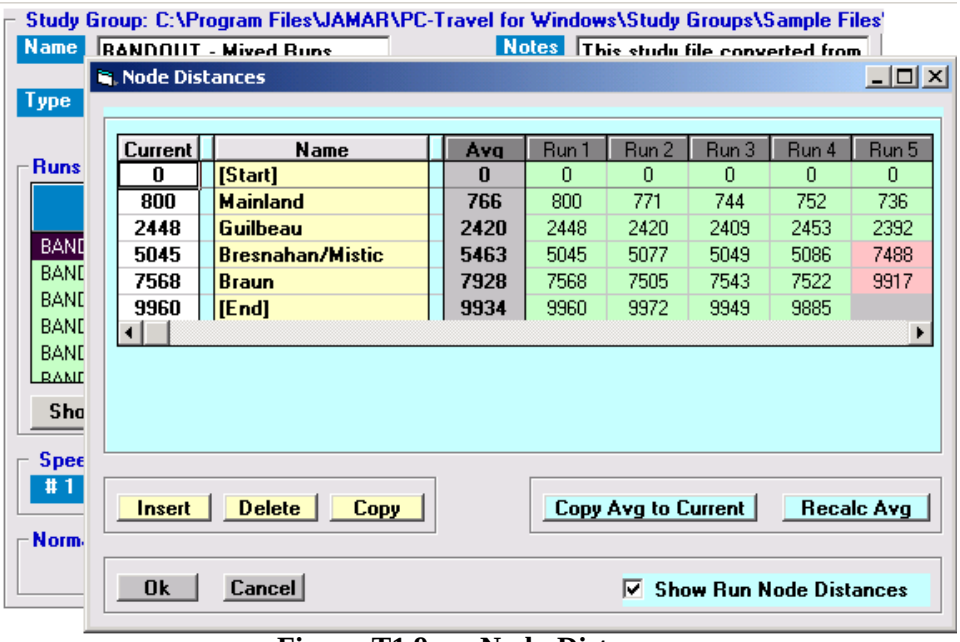


Figure T1.9 — Node Distances

Every study, like the runs that it is made from, starts at one well-defined point and ends at another, and usually has nodes in between. These nodes are usually cross streets, but can be anything that is easy to see while you are driving. The program needs to know the names of each of the nodes and the distance that each node is from the starting point. Various statistics are calculated, displayed, and printed in the reports not just on the entire route, but on a node to node basis as well.

The Node Distances screen shown above shows the **Names** of the nodes and the **Current** distances assigned to each node. ***Ultimately, the only thing that matters is that the Current column has the best possible distances.*** The distances default to the values of the first Primary run, which often is close enough to use. However, these rarely are the *best possible* distances. There are several ways to get these better distances. They will all be explained very carefully in another tutorial, but for now you will just get a quick summary.

As you saw in the Run Detail screen, each Primary run has node names and distances that you entered when you entered the data for that run. The program uses the averages of the node distances in all of the Primary runs to calculate the best possible node distances for the study.

The Node Distance screen shows the node distances for each of the Primary runs in the study. This is shown in the upper right section of the screen. The **Avg** column is the average of all of the run distances in that row. In this case, there are six runs *(only five are visible without scrolling)*.

Notice that most of the numbers have a green background, and two have red backgrounds.

The software knows that each number should be close in value to the other numbers in the same row, since they represent the attempt of the data collector to mark the same node. The software compares each number to the value in the Avg column. If the two numbers are close *(within 500 feet by default, but you can change this in the Preferences screen)* then it shows a green background. If it isn't close, then it shows a red background.

Look at the two red values. It is pretty clear what happened here. The data collector missed the node at Bresnahan/Mistic in Run 5. This makes the other two distances out of place.

You can fix this easily. Just follow along:

1- Click on the number 9917. A solid border appears around the cell.
2- Point the cursor at the bottom of the cell, right on the line. The cursor will change from a cross to an arrow.
3- Press and hold the left mouse button and drag the cell down one cell.
4- Let go of the mouse button.
5- The 9917 cell is now one row lower.
6- Repeat steps 1-4 with the number 7488.

We now have the distances in the proper rows.

Click on **Recalc Avg**. The values in the Avg column change, and now all of the numbers have green backgrounds.

Click on **Copy Avg to Current.** The values in the **Current** column now match the **Avg** column. These values are now the best we can get from our data, and are probably more accurate than just choosing the distances in any one run.

When you are happy with the values in the Current column, click **Ok**. If you get the distances all messed up, just hit **Cancel** to go back to Study Summary without making any changes.

The new distance values are not a permanent part of the study yet. If you want to save the new values with the study, then click on the **Save** icon. The new distances, plus any other changes to the study you have made, are saved.

This whole procedure may seem a little cumbersome, but if you don't want to fiddle with the node distances you don't have to. You can accept the initial values shown in the **Current** column, which are based on the first run, or you can simply type in the values you want in the **Current** column. Only the distances in the **Current** column are editable.

You should be back at the Study Summary screen now.

Study Statistics

Click on the icon labeled **Stats** in the toolbar at the top of the Study Summary screen.

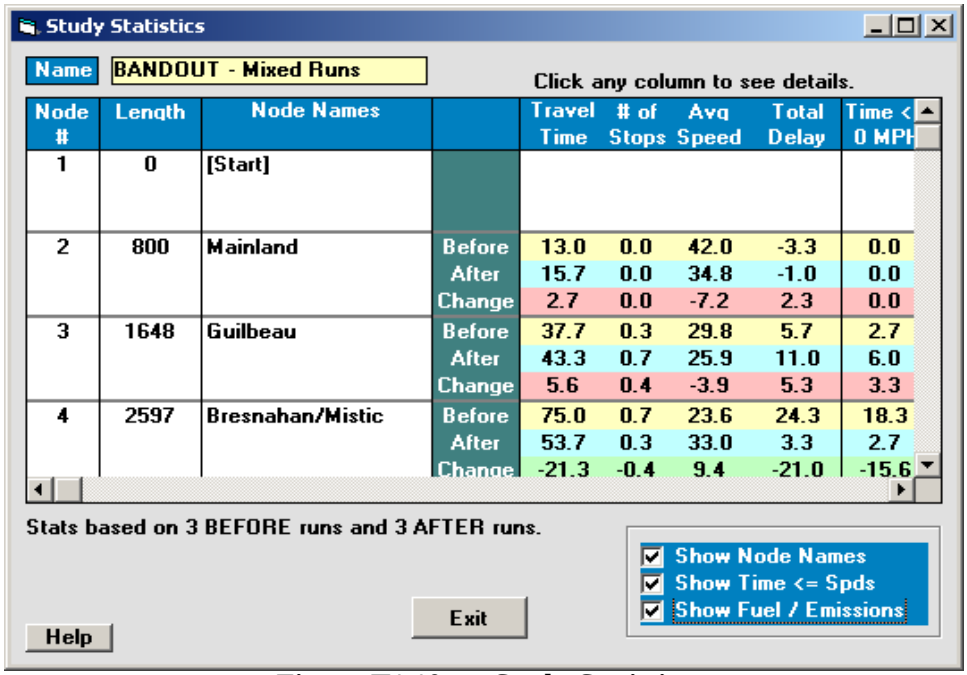


Figure T1.10 — Study Statistics

This screen lets you see a summary of the statistics for your study. All of the stats shown are averages of the data contained in the runs. Runs labeled as Before Runs are treated separately from After Runs.

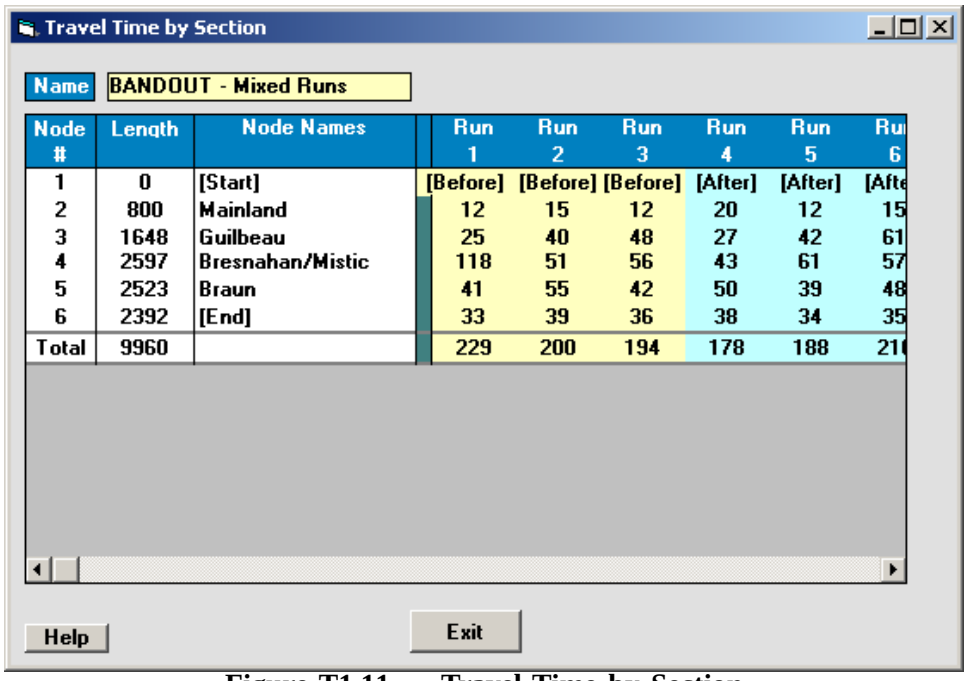
A separate row labeled Change shows the difference between the Before and After values for each node. The background colors in the Change cells are coded to show if the change is good or bad. Since you want lower Travel Times *(I assume)*, a negative change in Travel Time is good, so it is green. A lower Average Speed is bad, so a negative change in Average Speed is red, and so on.

Since there is too much information to show everything on one screen, you need to scroll around to see all of the stats. The three checkboxes let you choose what groups of data to show. You can play with them for a minute to see what they do.

If you scroll down to the bottom of the list, after the last node, you will find a set of total statistics for the entire route.

If your study doesn't have both Before and After runs then the screen looks a little different. There is only one line per node, and obviously, no Change row.

If you want to see where these numbers came from, you can see the Study Details screen for each statistic. For example, to see the details for Travel Time, click the mouse on any cell in the Travel Time column. You will see a screen like figure T1.11 below.



Node #	Length	Node Names	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
1	0	[Start]	[Before]	[Before]	[Before]	[After]	[After]	[Afte
2	800	Mainland	12	15	12	20	12	15
3	1648	Guilbeau	25	40	48	27	42	61
4	2597	Bresnahan/Mistic	118	51	56	43	61	57
5	2523	Braun	41	55	42	50	39	48
6	2392	[End]	33	39	36	38	34	35
Total	9960		229	200	194	178	188	21

Figure T1.11 — Travel Time by Section

The travel times of each run, for each node, is shown. The Before runs are shown with a yellow background, the After runs with a blue background.

The data on the Study Stats screen *(the previous screen)* are averages of these values. For example the Travel Times for the Before runs from the start to Mainland are 12, 15, and 12 seconds. If you check the Study Stats screen you will see that the average shown is 13.

You can check the other stats in the same way. Click anywhere in the column of the stat you want to see to bring up a similar screen.

You can also get to these screens from the **View** menu on the Study Summary screen.

Normally, you probably would never check these screens. However you may see a statistic on the Study Stats screen *(or a report)* that seems odd. You can check to see where the data came from by examining the Study Details screens. You may find a run with bad data, or one where the node distances were incorrect.

Click **Exit** to return to the ***Study Details*** screen, then click **Exit** again to return to the ***Study Summary*** screen.

Study Plots

Click the toolbar icon labeled **SpdPlt**.

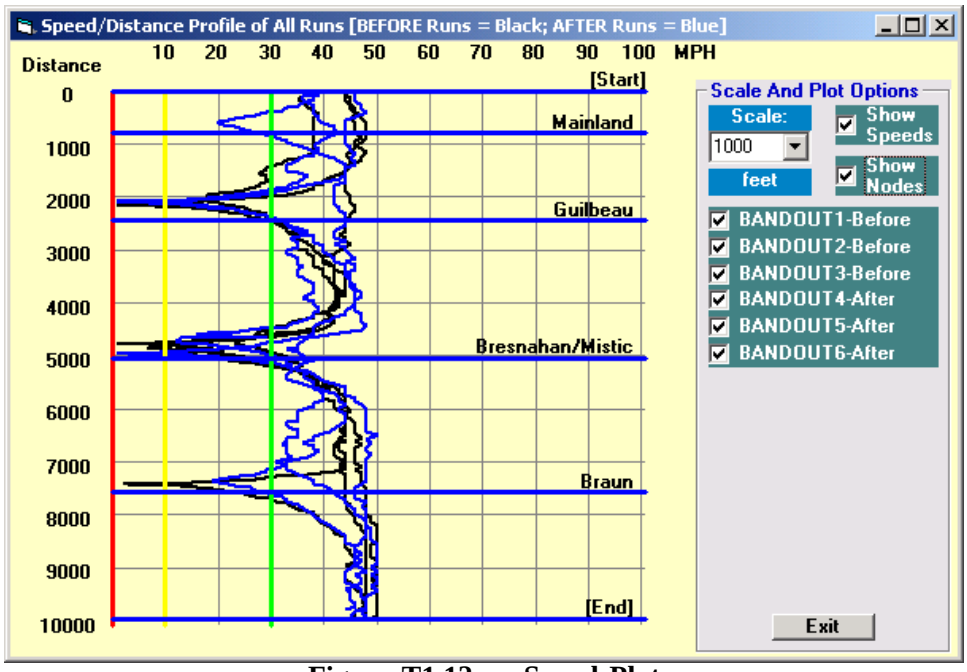


Figure T1.12 — Speed Plot

This screen shows Speed Profile plots of all of the runs in the study. You can select which runs to show, the scale for the graph, and whether to show the node distances and names and/or the speed categories. This will give you a quick look at the data before you print it. You might find a problem with one of the runs when you see them all plotted on the same graph. Click **Exit** to return to the Study Summary screen.

Click the toolbar icon labeled **TSDiag.** This screen shows a Time/Space Trajectory plot of each of the runs in the study. As in the Speed Profile plot, you can control various aspects of the plot. The straight green line shows the Normal Speed as set on the Study Summary screen. This plot is another way of seeing the data for all of the runs at one time. Click **Exit** to return to the Study Summary screen.

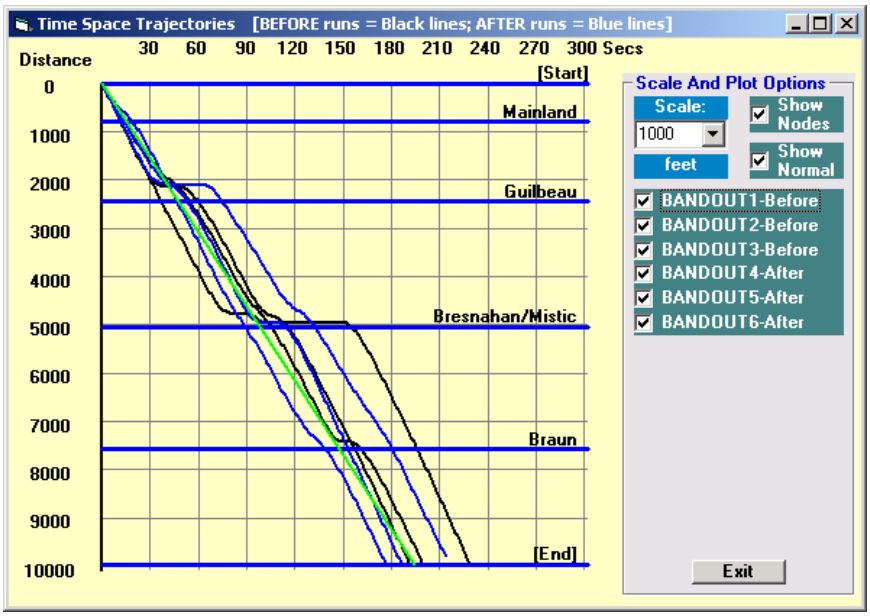


Figure T1.13 — Time Space Trajectory Plot

By now you should have a pretty good idea if your study is set up properly and has good analysis results. It is time to print the reports.

Reports

The end results of almost all Travel Time studies are the reports, and special attention has been given to the design of the reports in this program.

Click the toolbar icon labeled **Print**, or select **Print** from the **File** menu.

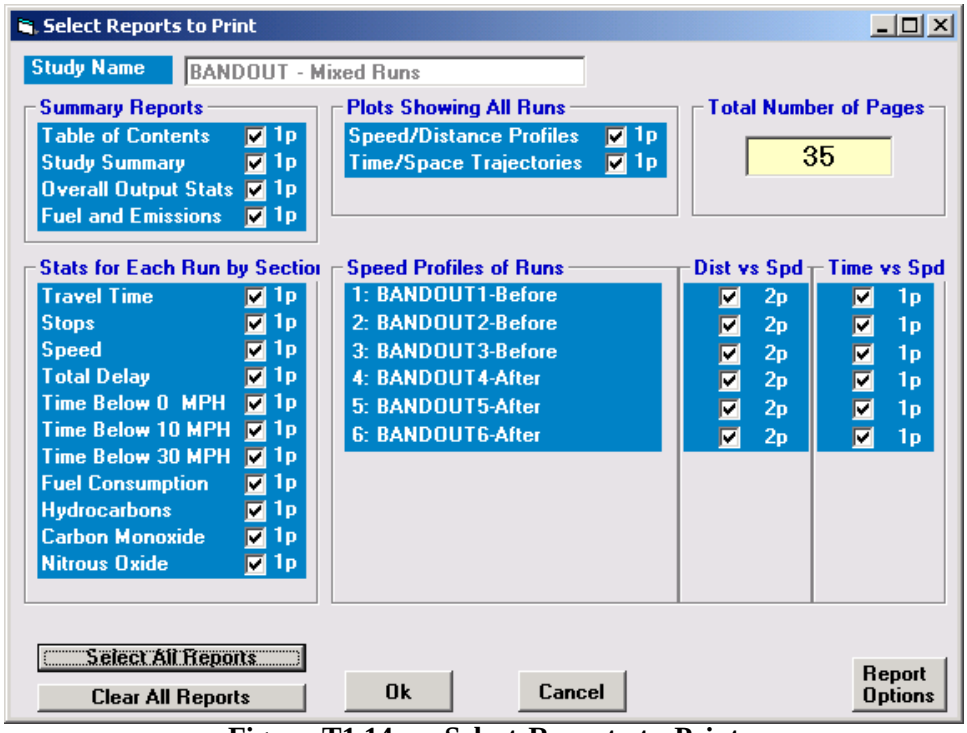


Figure T1.14 — Select Reports to Print

The screen you see is a list of all of the reports you can print with the current study. There are 17 standard reports that are always available, and then there are two types of plots that you can print for each run in the study. The screen shows the name of each run with check boxes for each of the two types of run plots you can print.

The idea is simple, just ***click the reports you want to print***. All reports with a check in the checkbox next to the report will be included in the report.

There are two buttons in the lower left corner. One **Selects All** of the reports and the other **Clears All** of the reports. Their meaning should be obvious.

In the upper right hand corner is a little window that shows the total number of pages for the reports you have selected. The number changes automatically as you select or de-select different reports.

Most of the reports are only one page. They are shown with a small **1p** next to the check box. The **Speed Profiles of Runs** plots are often more than one page. The number of pages in each of these reports is also shown next to the checkbox.

Once you have selected the reports you want to print, click **Ok**. If you change your mind and decide not to print any reports at this time, click **Cancel**.

Report Options

You can select different options before you print the reports. To select the options you want, click the button labeled **Report Options**.

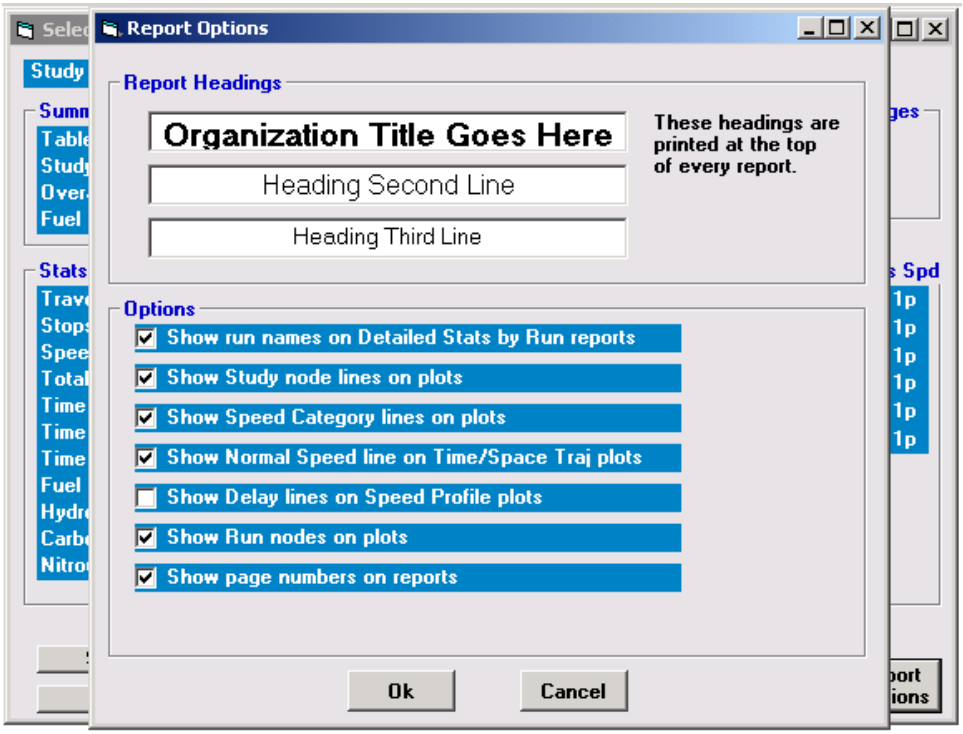


Figure T1.15 — Report Options

The top section shows the three titles that are printed on the top of every report. Normally you would fill this out once and never edit it again. However, some users like to change the titles often, especially consultants who will put the name of the customer, rather than their own name, on each report. It's up to you.

The top line usually is the name of your organization. It is printed in larger type, in bold, and centered on the top of every report. The next two lines are smaller, but still centered under the top title. You don't have to use all three lines, you can leave the second or third lines blank if you want.

The bottom section shows other options you can set before you print the reports. Your choices for these options may vary from study to study, although you may just set all of the options on and forget about it. The options may not make much sense right now. That's not important for now. Just accept the defaults.

All of the settings on this screen are duplicated in the Report Option tab on the Preferences screen. *See Appendix 1 for a complete description of each of these options.* That is where you would set the default value for each title and option. You use the screen shown here only to change any of the default values. If you know that you don't need to change any of the default values *(which is the usual case)* then you don't need to go to this screen at all.

Click **Ok** when all of the options are set the way you want them. This will bring you back to the **Select Reports to Print** screen.

Once you have selected the reports you want to print, and have selected the options for the reports, you are ready to preview the reports. Click **Ok**.

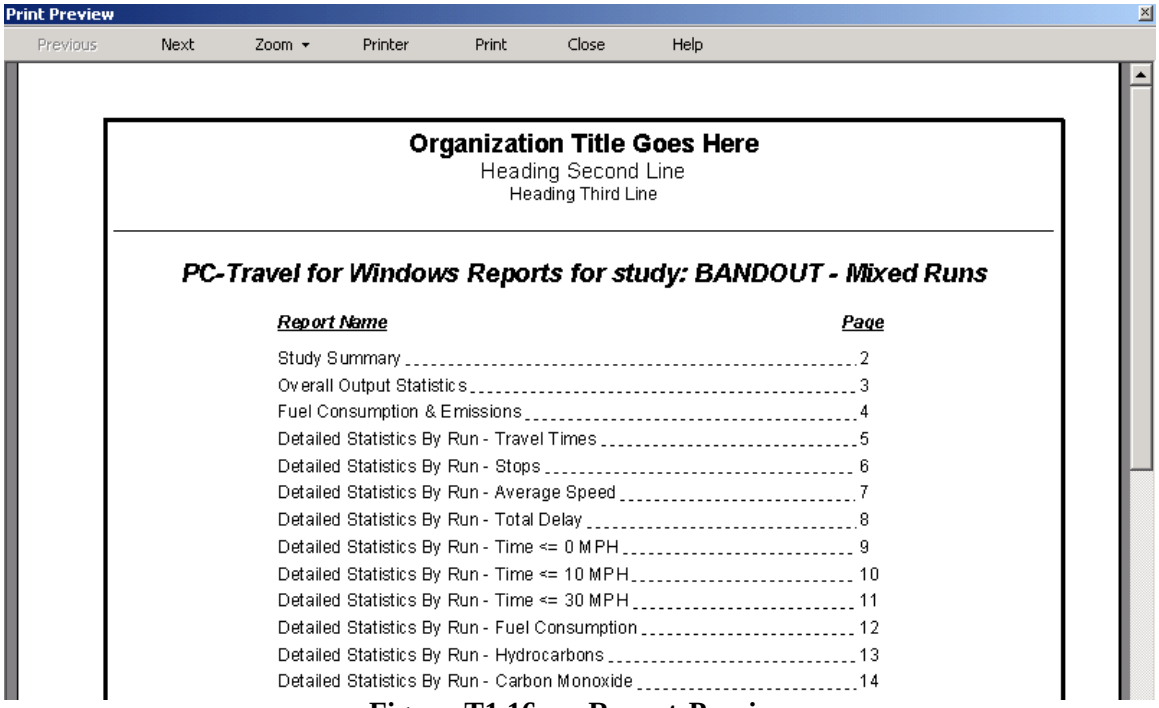


Figure T1.16 — Report Preview

Above is an example of the screen you might see. In this case I selected all of the reports on the previous screen. This is the Table of Contents page that lists all of the reports and the page number for each report.

At the top of the screen are the navigation buttons to control the preview of the reports, select the printer, print the reports, and exit the preview.

Click the **Next** and **Previous** buttons to move from page to page to see what each of the reports look like.

Click the **Zoom** button to select different views. Select the Thumbnail view *(my favorite)* from the drop down list, then double click on any of the reports to quickly go to that page.

Click the **Printer** button to display the standard Windows printer select dialog box. If you have multiple printers available to you, you can choose the printer here.

Click the **Print** button to print the reports.

Click the **Close** button to return to the Study Summary screen.

Feel free to play with all of the options available on these screens. You also might try changing some of the Report Options to see the effect on the reports. Remember, you don't have to print out the actual reports to see the different options, you can just preview the report pages on the screen.

Summary

If you made it all of the way through this tutorial, congratulations.

In this tutorial we retrieved an existing study, displayed the run details of the runs in the study, edited the node distances of the runs to find the best possible node distances for the study, displayed the study details in both tabular and graphical form, and finally previewed and then printed a complete set of reports for the study.

Hopefully you now have a pretty good idea of how the core features of the software work.

Several areas of the software were not discussed at all, and a few others were just briefly discussed. Other Tutorials and Appendices in this Reference Manual explain these areas in more detail.

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Tutorial 2

How to do a Fixed-Route Travel Time Study

How to Do a Fixed Route Travel Time Study

This tutorial is a step-by-step guide to use a TDC-8 counter to do a fixed route travel time study on an arterial street. It assumes you have the following:

1 – Transmission sensor installed in your test vehicle.
2 – JAMAR TDC-8 counter.
3 – New Link pushbutton switch connected to the TDC-8.
4 – TDC-8 Sensor Interface Cable.
(Note 3 & 4 are included in the TDC-8 Travel Time Kit)

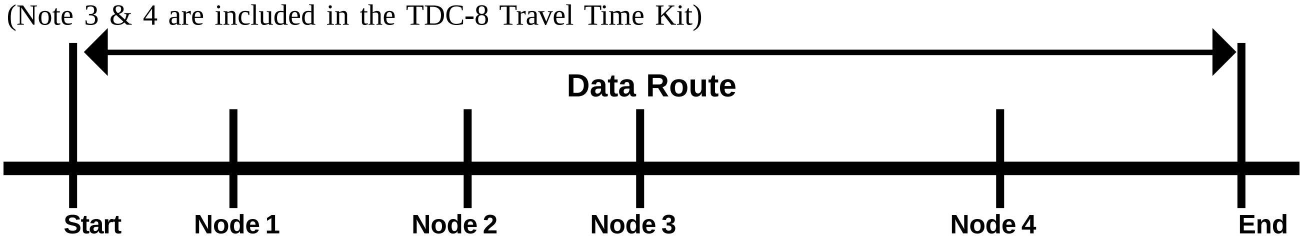


Figure T2.1 — Data Route

Step 1 — Define the Route

This step may seem obvious, but it is easy to forget some important points. You need to define a starting point, an ending point, and the intermediate nodes. Normally the starting, ending, and intermediate nodes are intersections, but they can be other landmarks such as bridge abutments, mile post markers, or other fixed landmarks. Pick points that can be easily identified now and when future *after* runs may be collected. The drawing above shows a simplified diagram of a typical study route. There is a starting node, which could be an intersection, four nodes, which could be signalized intersections, and an ending node.

Make a rough sketch of the route, clearly showing the starting and ending points and list the intermediate nodes you want to use *(see step 2)*. You don't have to make every intersection a node. It is important to understand the type of information you want the data to give you before you define the route and nodes. Don't use more nodes than you really need; it just needlessly complicates the analysis.

Figure T2.2 — Field Worksheet

Step 2 — Prepare the Field Worksheet

You should always keep field notes when you do travel time studies. The field notes help you keep track of the runs when you get back to the office. The Appendix has a master copy of a sample field worksheet to help you store all of the information about the runs you make. You should make copies of this form, or use it as a guide to develop your own field sheet. Also included is a sample of a worksheet that has been filled out *(shown here in reduced form)* to give you an idea of how the form is used.

Before you start the data collection, fill in the general information about the session at the top of the sheet. List the starting point, ending point, and any intermediate nodes.

Step 3 — Connect the TDC-8 to the Test Vehicle

Figure T2.3 — TDC-8

This tutorial assumes you have installed and tested a transmission sensor in the test car. Refer to the instructions that came with the sensor to install it in the test vehicle.

Connect the transmission sensor to the TDC-8 using the Sensor Interface Cable. The five pin DIN connector goes to the transmission sensor cable. The other end plugs into the serial connector jack on the TDC-8. Make sure you tighten the lock-down screws on this connector to assure a good connection.

Also connect the pushbutton switch to the TDC-8. You don't have to use the pushbutton switch; you can use the BANK 2 button on the TDC-8. However, if you are doing a study by yourself, the pushbutton switch is much easier and safer to use.

Note: Plug the pushbutton switch into the jack labeled Bank 1 on the side of the TDC-8. This is actually connected to the Bank 2 switch in the counter. The labels for the two jacks are reversed on the side of the TDC-8.

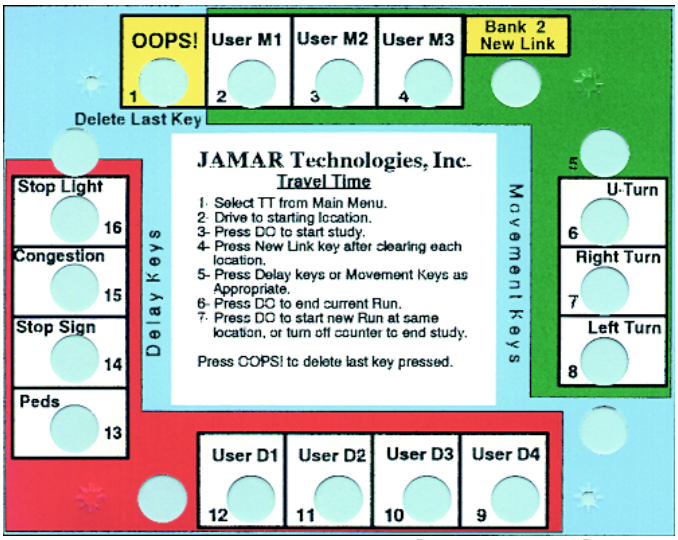


Figure T2.4 — TDC-8 Travel Time Template

The diagram to the left shows the Travel Time overlay that comes with the TDC-8. It has a set of brief directions printed on the middle of the overlay to help you remember how to do a Travel Time study. It also defines the buttons that you can use when you do a study.

Actually, you only need to use two buttons to do a typical study; the DO button to start and stop runs, and the BANK 2 button *(via the pushbutton switch)* to define node distances.

However, PC-Travel for Windows lets you use other buttons to define other events that you can monitor when you do a study. These other events can be sources of delay during a run, such as a signal, stop sign, congestion, etc. You can also assign your own *(for example, a construction zone delay could be assigned to button 12)*. These delay buttons are grouped on the left side of the overlay and have a red background. You can also use the buttons to define *movements* made by the vehicle during a run, in case the route isn't along a single arterial. These movement options are shown in green on the overlay.

If you use the delay buttons, you can have the software show where the delays occurred on several of the plots supported in the program. If you want to use the delay buttons, you should have another person in the car collecting the data while you drive; it isn't safe to try to collect delay data while you drive.

Step 4 — Calibrate the TDC-8

If you have already calibrated your test car *(possibly with a JAMAR Distance Measuring Instrument)*, you can skip this step, unless you have made a change in your vehicle which affects the calibration, such as getting new tires or changing their inflation pressure. The TDC-8 will remember the last calibration constant used. If you have several test vehicles you can enter the calibration constant using the edit feature of the TDC-8's calibration routine. If you use multiple vehicles, you will help yourself by posting the calibration constant in the vehicle.

The calibration constant used should be between 0500 and 1200. If not, you must adjust the jumper block in the transmission sensor.

```
TRAVEL CALIBRATE
                EXIT
Edit or Measure the
Calibration Constant
```

```
EDIT MEASURE EXIT

Measure a new
Calibration Constant
```

```
Enter calibration
 distance (ft): 2000
BANK1-TAB = cancel
DO = done
```

```
Drive to beginning
of calibration run..

Press DO to start...
```

```
Counting pulses:
      0473
Press DO at end of
calibration distance
```

```
Calibration Constant
      0882
Press DO to return
to Travel Time menu
```

Calibration requires a little advanced preparation. Find a location in your area where a straight and flat section of sparsely traveled road can be used. Have a section of the road surveyed so that the distance between two fixed landmarks is accurately measured. The distance should be between 1000-3000 feet, though lengths up to 9999 feet can be used.

Drive to the first marker and stop *(that's why a sparsely traveled road is desirable)* so that the test car is immediately adjacent to the marker. Invoke the TDC-8's calibration procedure by selecting a new TT count and then tabbing to the CALIBRATE option and pressing the DO button. Select MEASURE and then press the DO button. Next, enter the calibration distance, which is the distance resulting from your survey. Remember, the "10" button on the TDC-8 gives you a zero. If you haven't already, drive to the start of the calibration distance. You should always come to a complete stop for several seconds before starting the calibration run. This stop will ensure that no distance error results from the reaction time of pressing the button.

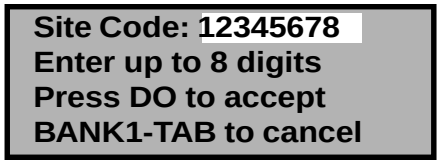
Once in position, press the DO button again, then drive to the end of the calibration course. The TDC-8 will show you how many pulses are being received from the transmission sensor as you traverse the calibration distance. Drive to the second landmark and again come to a complete stop immediately adjacent to the marker. Then press the DO button again, and the calibration constant will be displayed. The constant is the same value used in PC-Travel for Windows, and you should write it down on your field notes.

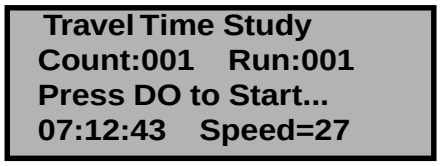
IMPORTANT: The calibration constant used should be between 0500 and 1200. If your calibration constant is outside this range, you will need to adjust the jumper block in the transmission sensor then re-calibrate. Refer to the documentation that came with the sensor for information on how to do this. *If you use a calibration constant outside the 0500 to 1200 range you may not receive accurate data.*

That's all there is to calibration. The TDC-8 will store the constant until you change it.

Step 5 — Prepare the TDC-8

Go through the preparation of the TDC-8 for a travel time (TT) study: From the Main Menu, select COUNT, then NEW, then TT. That will bring you to the point shown in the first screen shown here. Select TRAVEL and press DO. Enter a numeric site code *(there isn't much reason to go through the hassle of entering an alpha-numeric site code; pick a numeric one and write it in your field notes in case you need it later)*, and press DO *(the second screen)* and proceed until the TDC-8 says to press DO to start the study *(the third screen)*.



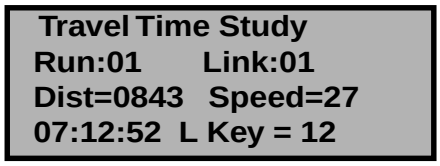


The screen now shows the Count number, Run number, time, and speed if the car is moving.

Note: Step 5 can be done in the office or, more commonly, in a parking lot near the start of the route.

Step 6 — Start a Run

Drive to the starting point so that when you pass the starting point you are traveling at the proper speed with the rest of the traffic. Press the DO button as accurately as you can as you pass the starting point; this begins data collection.



The display shows the run number, link number *(how many times you have pressed the New Link button this run)*, time, distance traveled so far this run, speed, as well as the last delay button pushed *(the L Key = value)*. As you proceed along the route, press the New Link button as you pass each new section.

Note: Check the speed reading on the TDC-8 and make sure it is close to the speed on the speedometer. If they are not reasonably close (within a few MPHs), it may indicate a problem with the sensor or an incorrect Calibration Constant. Don't collect data if the speed isn't right; the data almost certainly won't be correct.

Note: If you have chosen intersections as your nodes, wait until you exit the intersection to press the New Link button. This will ensure that any delay associated with stops at the intersection will be reported in the correct section.

If you forget to press the New Link button at a location, continue the run to its stopping point as normal. You can add a node to the run later when you process the data. Make a note on the field sheet at the end of the run about the missing data.

If you hit the New Link button or a delay button by mistake, continue the run. You can edit the run data in the office if needed. Make a note on the field sheet at the end of the run about the extra data.

If you have an additional person in the car to push buttons, they may press the delay buttons as appropriate during the run. You can use the Travel Time overlay that came with the TDC-8 to describe the delays you encounter during the run, or you can assign your own definitions to the buttons; the software lets you define the delay buttons any way you want.

Step 7 — Stop the Run

Press the DO button on the TDC-8 when you have reached the end of the route. If the end is the last intersection, remember to press the button as you *depart* the intersection. This ends the run and the TDC-8 stops collecting data until you press the DO button again, signifying the start of a new run.

You may turn around and collect data in the other direction. In this case you press the DO key when you go by the first intersection *(the END node of the previous run)*, press the New Link button as you go through each of the nodes, and press the DO button to end the run when you get to the last node *(the START node of the previous run)*.

It is important to understand that the various runs in the two different directions are not going to be combined in any way in the software. Travel times and other statistics have no meaning unless they represent travel along the same route, *in the same direction*. However, it is usually useful to collect data in both directions, and if you use the same nodes for both directions, you will not have to enter the names of the nodes twice later in the office. The software lets you enter the node names once, and then copy and reverse the order for the runs in the other direction. For this reason, we always suggest that you collect data in both directions, and use the same nodes for both directions.

Note: Remember that you press the DO button to start and stop a run. You press the New Link button for nodes in between.

Step 8 — Make More Runs

Repeat Steps 6 & 7 until you have completed the session, then just turn the TDC-8 off. There is considerable debate on how many runs you should do to have statistically significant data, but the general consensus is that at least 3-5 runs in each direction are necessary, with the more runs the better.

Tutorial 3

How to Process Run Data from a TDC-8

How to Process Run Data in a TDC-8

This tutorial is about how you get the data collected in the TDC-8 into edited runs.

Since you probably don't have a TDC-8 with travel time data in it lying around, we'll fake it a bit for this tutorial.

Select **Convert TDC-8 Travel Time Data** from the **File** menu in the ***Study Summary*** screen. The ***Select TDC Data*** screen is displayed, as shown in figure T3.1 below.

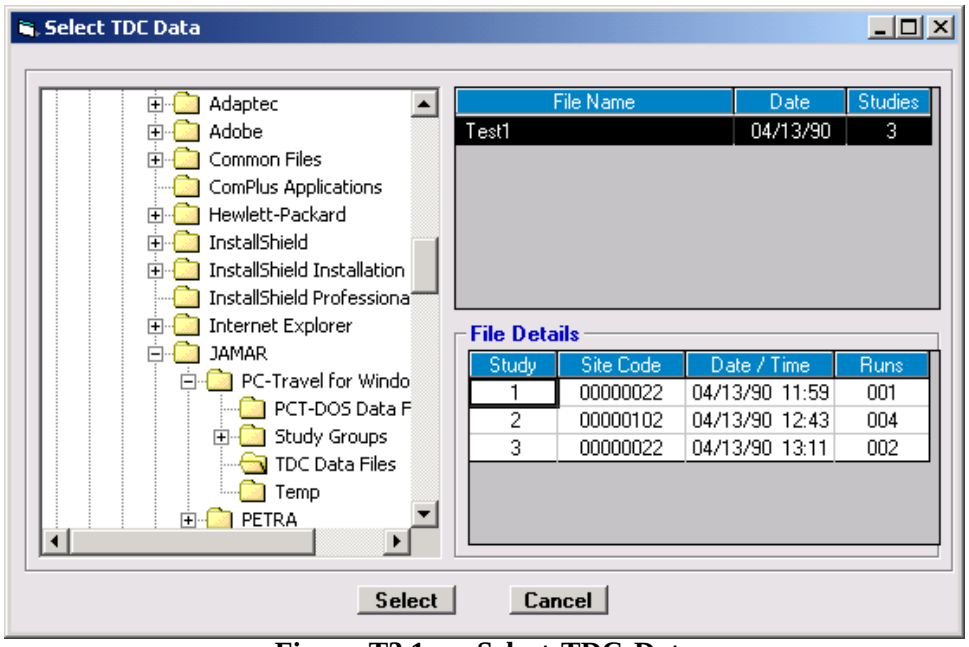


Figure T3.1 — Select TDC Data

This screen shows any files with a .tdc extension, which are text-like files you get if you store the data downloaded from a TDC-8 count board. The install routine created a folder called ***TDC Data Files*** and copied a file called Test1.tdc to that folder.

The left side of the screen shows the familiar tree layout of your computer, with the ***TDC Data Files*** folder selected. The upper right window shows that there is only one file in it now, called ***Test1***. The file was created on 4/13/90 and has 3 studies in it.

The ***File Details*** window shows more info about the three studies, such as the Site Code, Date and Time, and the number of Runs in each study. The file details help you pick the correct File Name to process. Since there is only one file, that decision is easy.

Click **Select** to select the Test1 file.

The next screen you see is the same screen you would have seen if you had read the TDC-8 counter with this data in it. There is another screen that helps you connect the TDC-8 properly and dump it, but that screen is pretty simple *(and almost identical to the screen in PETRA if you happen to have that software)* so it isn't shown in this tutorial.

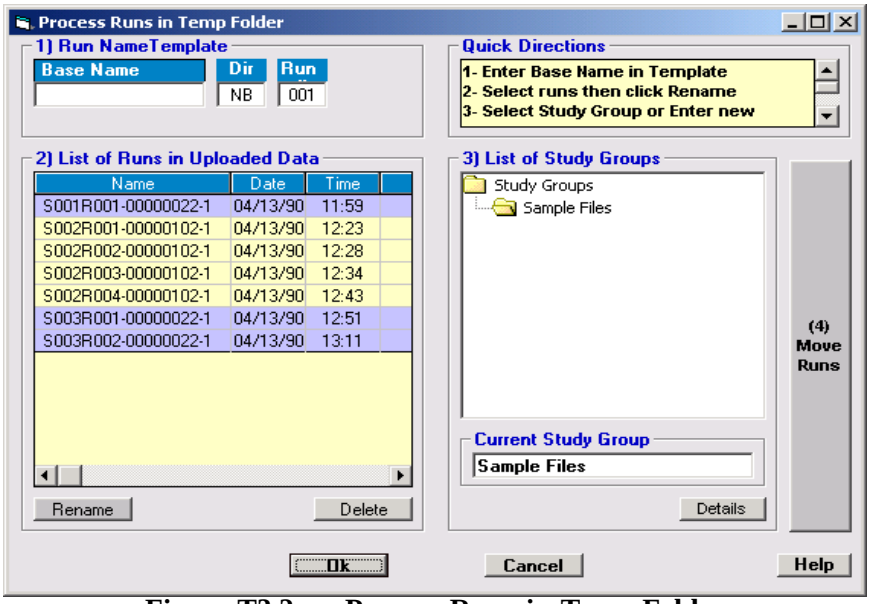


Figure T3.2 — Process Runs in Temp Folder

You have collected data with the TDC-8 counter. That data has no real resemblance to the run file format the software needs. This screen attempts to solve the following problem:

> ***What is the simplest procedure for an experienced user to take the data from the counter and end up with proper PC-Travel for Windows runs that can be built into studies?***

When you read the data from your TDC-8, the data in the counter is read into a temporary file and automatically stored in the ***TDC Data File*** folder *(as specified in the Preferences screen)*. At this point, you can clear the counter and go do other studies with it.

The program then processes the data in the temp file into individual runs and stores them in the ***Temp*** folder, *(again as specified in the Preferences screen)*. Each run is given a unique name using the following naming logic: SxxxRyyy-CCCCCCCC-N, where xxx is the study number, yyy is the run number, CC... is the site code from the data, and N is a number that is used to break ties in case two runs have the same other specs.

The program then displays the screen shown above. The large window on the left side of the screen shows the runs from the counter named using the convention just described. The background color alternates to separate runs from different studies.

You can see in this example that the first study just has one run, the second has four, and the third has two. Let's pretend the field notes show that the first run was just for practice. The next four runs were good runs. Runs 1 & 3 were northbound, 2 & 4 southbound. The last two runs were done at a different location, first westbound, then eastbound.

This is the starting point. The ending point will be when all of the temporary runs have been renamed and moved into a new or old Study Group. This is a four step process. While it isn't necessary to do the operations strictly in the order shown, it is probably a good idea to do it that way for a while until you feel comfortable with the process.

1 — Enter Base Name in Template

The ***Base Name*** is just a name that helps you identify a run as belonging to a group of similarly named runs. From the field notes *(continuing the example from the last page)*, we know the first five runs were done on Fowler Ave., so we'll name all of these runs with a Base Name of Fowler Ave. Enter Fowler Ave. in the ***Base Name*** text box. Leave the Dir set to NB *(northbound)* and the Run # to 001.

2 — Select Runs then Click Rename

Study 1, Run 1 was just for practice, according to our notes. Runs 1 and 3 of Study 2 are northbound runs. We want to select them. Click on S002R001... and S002R003... then click on **Rename**. The names change to match the new name convention.

3 — Select Study Group

We want to move these two runs into a Study Group, but there isn't a Study Group we want to use. We need to create a new Study Group for these runs *(and later for any studies built from them)*. In the ***Current Study Group*** text box, type Fowler Ave NB then press **Enter**. This creates a new Study Group, which is shown in the ***List of Study Groups***. Click on the new Study Group to select it *(you can see it is selected because the folder is "open")*.

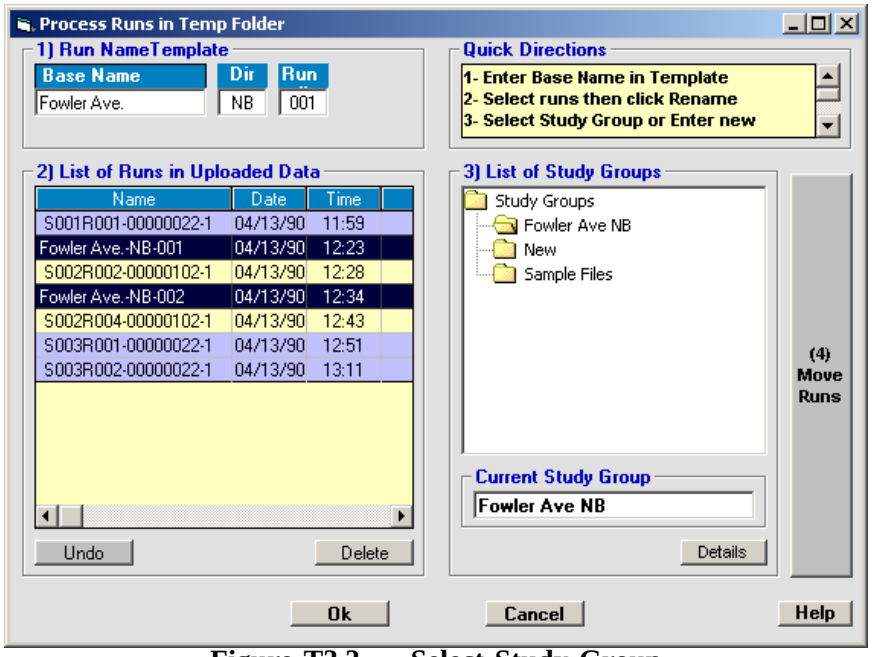


Figure T3.3 — Select Study Group

Your screen should now look like the one shown above. The runs with the new names are selected and the destination Study Group is shown in the ***Current Study Group*** text box.

4 — Click Move Runs

You are ready to move the runs to the new Study Group. Click the button on the far right labeled **(4) Move Runs**. The two runs disappear from the ***List of Runs***, showing that they have been moved.

That takes care of the northbound runs. Now you have to do the same thing for the southbound runs. Since we already went through it once, I'll just outline the procedure.

1 – Edit the **Dir** field in the ***Run Name Template*** to SB, for southbound.
2 – Select the two runs from the list (S002R002... & S002R004).
3 – Click **Rename**.
4 – Create a new Study Group called Fowler Ave SB.
5 – Select the new Study Group.
6 – Click **Move Runs** to move the runs.

This will reduce the List of Runs to three.

You can repeat the procedure for the two runs in Study 3, if you want. Since our hypothetical notes say they were done at a different location, you should create a new Study Group for them. Just make up any name. Put both of the runs in the new Study Group.

This leaves the single run. Since our notes say this was a practice run, then it isn't needed. Click on **Delete** to delete the run. The ***List of Runs*** is now empty. This is where you want to end up, with all of the runs from the counter renamed and moved to study groups.

Click on the **Ok** button to close the ***Process Run*** screen and return to the main screen.

Note: The procedure outlined up to this point may seem confusing at first glance. Once you get the hang of it though, you will be able to process run files very quickly.

At this point you have all of the runs from the counter renamed and moved to new study groups. The run data is not complete, however. The runs only contain the information that was available in the TDC counter, which includes the name, the date and time of the run, and the actual pulse data collected in the field. There still are other pieces of data that are required before a run can be used in a study. You need to add the node names, assuming you collected node data during the runs, and you also can add notes to the run details to help you explain the data when you do analyze the data as part of a study.

There are two different procedures you can follow to finish editing the run data details:

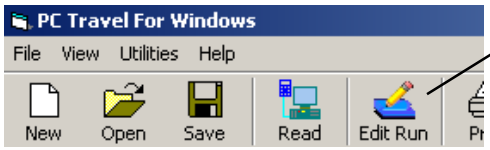
1 – Create a new study, and then edit the run details for the runs in that study. This is the most common procedure, since most users immediately create studies and print out the analysis reports after reading the data from the counter. This process is described in ***Tutorial 4 — How to Create a New Study*** and then ***Tutorial 5 — How to Edit Nodes in Individual Runs***.

2 – Edit all of the runs you just read from the counter before you create any studies. This is a good option if you plan to create the studies at a later date. You probably have the information you need to edit the runs at hand, since you brought the field sheets with you when you read the counter. You can edit the runs as needed, get them in really good shape, and then when you want to create the studies you won't have to worry about the runs at all. Some users prefer this method even if they plan to create the studies and print the analysis reports in the same session.

The next part of this tutorial shows you how to easily select a run to edit even if that run isn't part of a study as yet.

How to Select a Run to Edit

Assume that you have read a counter and processed the runs as described in this tutorial. You now have several runs in one or more study groups. The runs are not complete yet; they still need some information added to them *(primarily the node names, but other stuff as well).*



From the Main Menu, click on the ***Edit Run*** icon in the toolbar, as shown in the figure here. This will bring up the ***Select One Run*** screen as shown below.

Figure T3.4 — Edit Run Icon

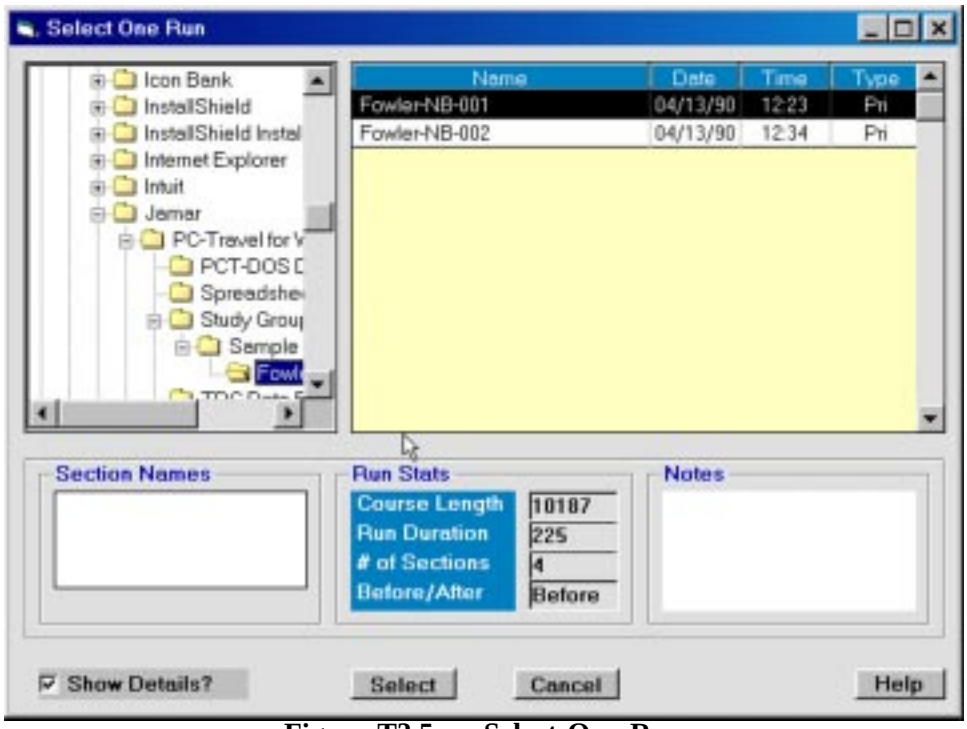


Figure T3.5 — Select One Run

There are three primary parts to this screen. The upper left window shows the familiar tree diagram of your Study Groups with the current Study group highlighted. The upper right window shows the runs that are in the highlighted Study Group. The name, date, time, and type of run are shown for each run. The bottom window shows additional information about the run that is highlighted in the upper right window.

The highlighted Study Group probably isn't the correct Study Group; you probably want to navigate to one of the new Study Groups you created when you processed the runs in your counter. If you followed the tutorial then you should have a folder under the Samples folder called Fowler NB. Click on that folder and you should see the screen shown in Figure T3.5.

There are the two runs you created earlier. The first run, ***Fowler - NB - 001*** is highlighted. There are no Node Names or Notes, so those sections are blank in the lower window. This is the run you want to edit, so click on the **Select** button at the bottom of the screen.

This brings up the Run Details screen shown in Figure T3.6.

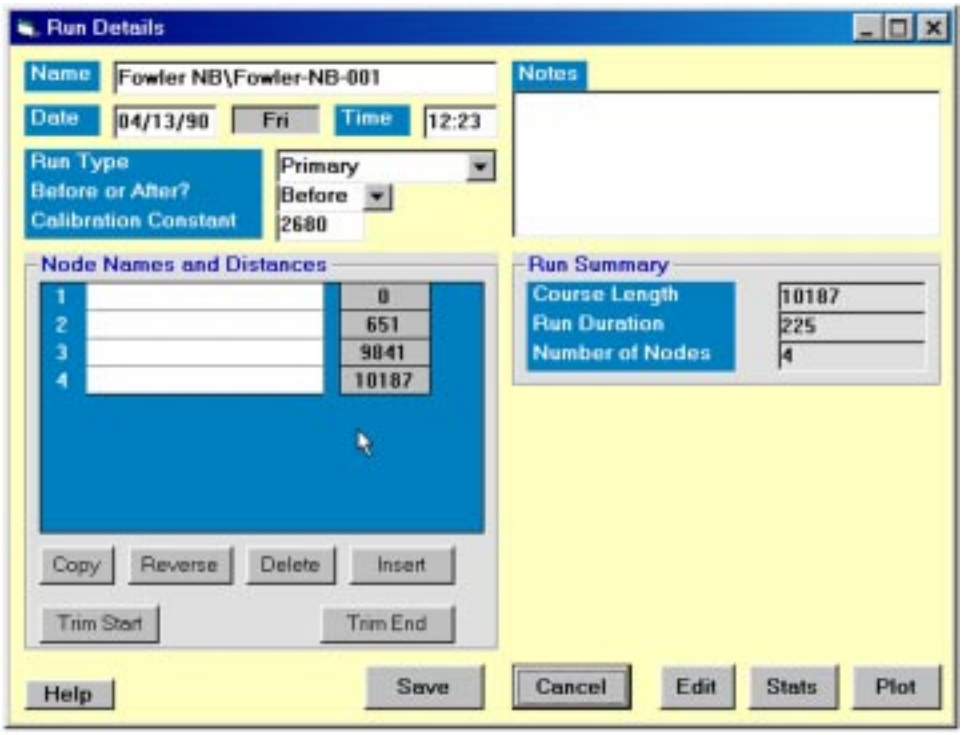


Figure T3.6 — Run Details Screen

Tutorial 5 explains in great length how you can edit the Node Names on this screen, so that information won't be repeated here. Once you are through editing the run, you click on the **Save** button. This will bring you back to the ***Select One Run*** screen shown in Figure T3.5, where you can select another run to edit.

You can systematically edit each of the runs in the Study Group, and then go to another Study Group *(Fowler SB in this case)* and edit each of the runs in that Study Group. When you are done you will have all of the runs completely edited and ready to be added to studies.

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Tutorial 4

How to Create a New Study

How to Create a New Study

This tutorial shows you how to create a new study from runs you have previously collected and stored on your computer.

In this case, we will create a study using three Before runs from the sample data that is installed with PC-Travel for Windows.

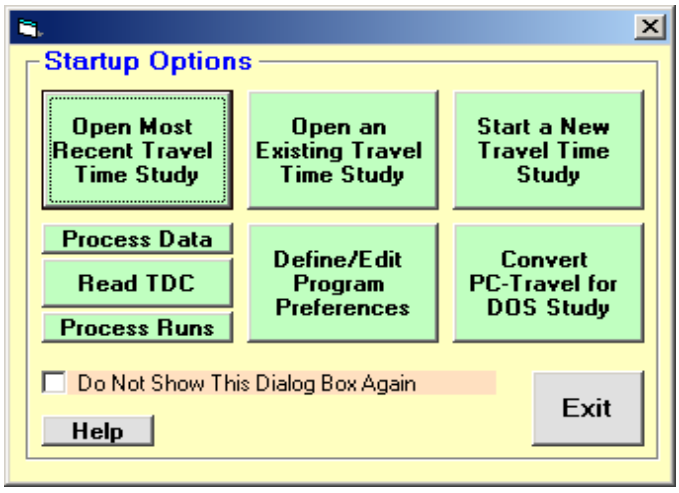

Figure T4.1 — Startup Options

Run PC-Travel for Windows. You will see the Startup Options, as shown here.

Click on the top, right button which is labeled **Start a New Travel Time Study**.

*Note: If you are already in the program, you can select **File: New** from the main menu, or click on the first toolbar, labeled **NEW,** at the top of the screen.*

You will see the screen shown in the figure below. This is a blank Study Details screen. At the bottom of the screen are the default values for the Speed Categories, Normal Speed, and Stop Speed. Everything else is blank.

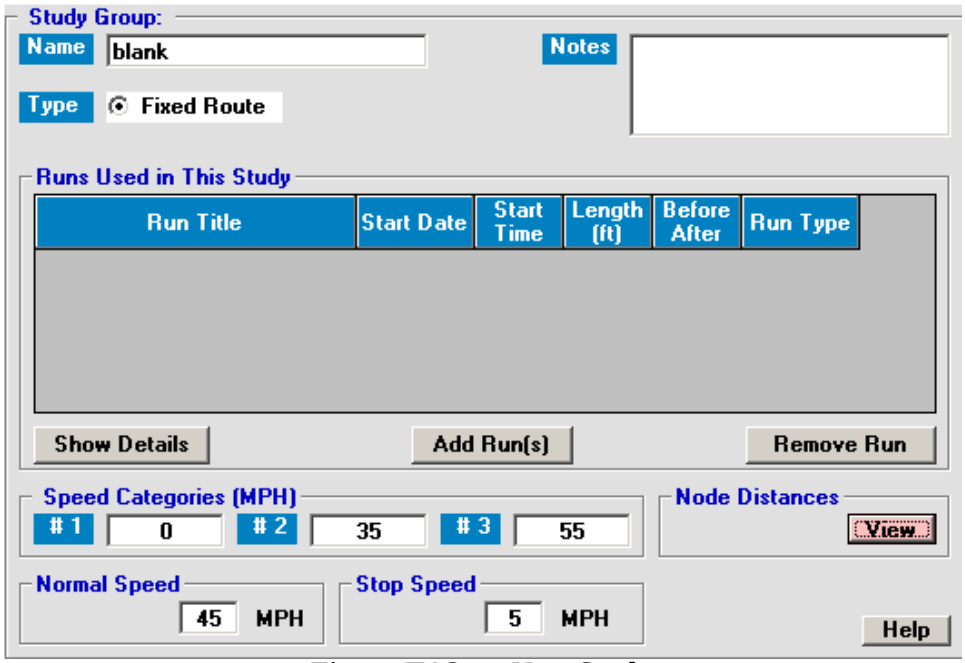

Figure T4.2 — New Study

Click on the **Add Run(s)** button in the center of the screen. This will bring up the ***Select Runs*** screen, which is similar to the screen shown in the figure T4.3 below. The left side of the screen shows the familiar tree of folders, with the Study Groups folder highlighted *(or whatever you have set as the Study Group Root Folder in the Preferences).*

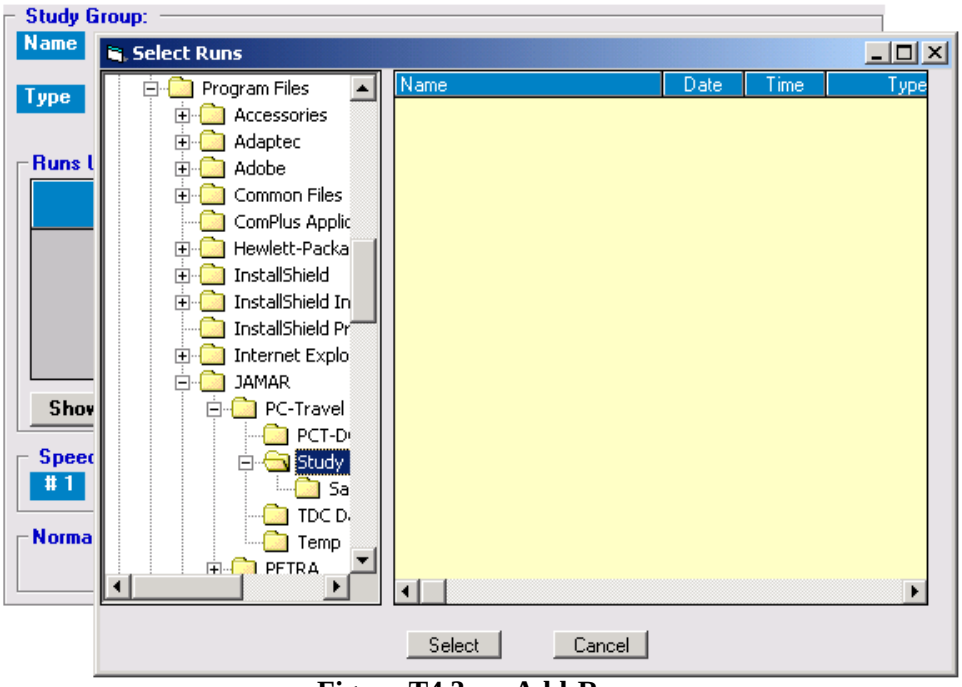

Figure T4.3 — Add Runs

Click on the study group named **Sample Files** in the tree, which is where the runs we want are located. The window to the right shows the six runs that are in that study group.

We want this study to be just the Before runs from that group. We previously had cleverly named the runs with Before and After suffixes, so it is easy to find the Before runs. Click on each of the three Before runs in the list. The runs you select are highlighted as you click them. Your screen should now look like this.

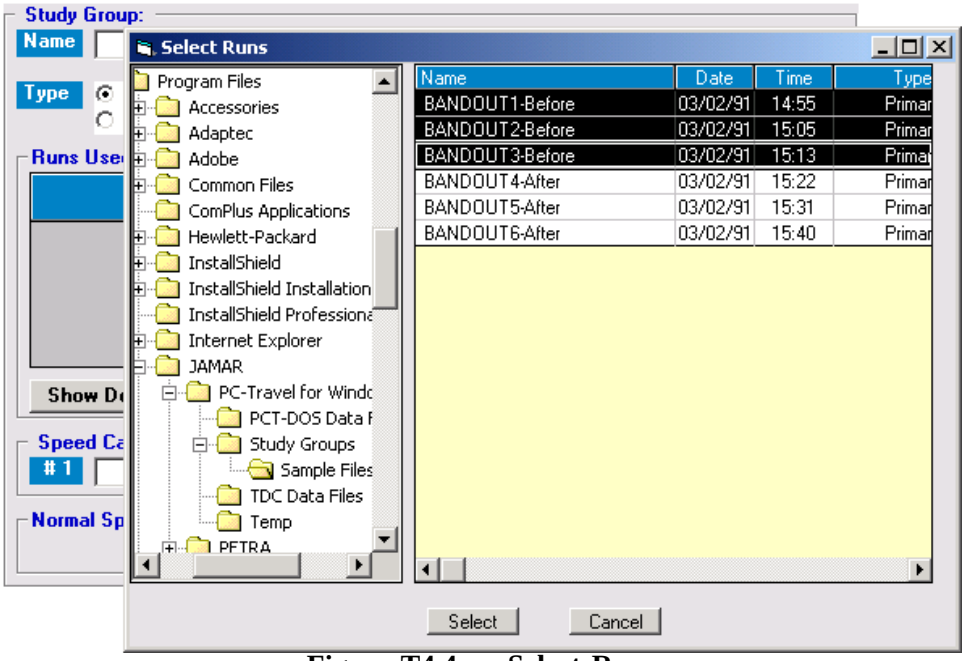

Figure T4.4 — Select Runs

These are all of the runs we want for this particular study, so click on the **Select** button. The ***Select Runs*** screen disappears, and the ***Study Summary*** screen now shows the three runs we just selected. Your screen should look like this:

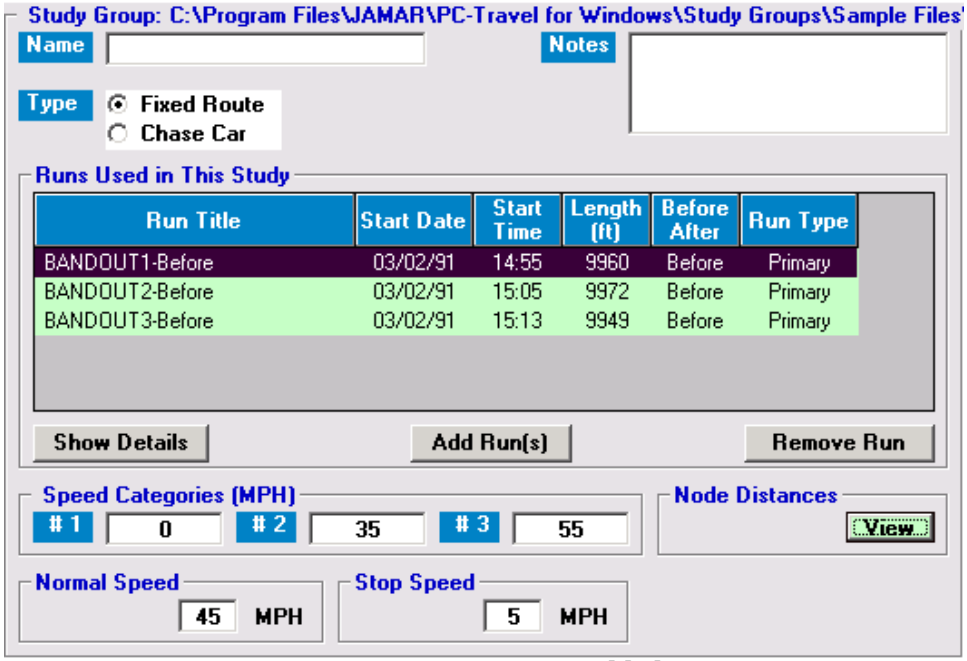

Figure T4.5 — Runs Added

The top of the screen, right above the Name label and text box, shows the Study Group as Sample Files, which is where the runs are located. The assumption always is that the study will be stored in the same study group as the runs.

You can view the ***Run Details*** of each or any of the runs by highlighting the run and clicking on the **Run Details** button. If these runs came from data just read from a TDC-8, then you would need to edit each of the runs and give them new names, check the node names and distances, etc. *(See Note below).*

Notice that the **View** button in the lower right corner is red. This indicates that you should check the study node distances to make sure the current distances are ok.

Click on the **View** button now. Notice that all of the distances have green backgrounds. That means that for each node, all of the run distances for that node are close to the same distance. In this case, you don't need to do anything with these distances. The distances in the Current column are fine as well. So just click the **OK** button to go back to the ***Study Details*** screen. If these runs came from data just read from a TDC-8, then there is a good chance that some of the node distances would be incorrect and you would need to edit the distances.

Current	Name	Avg	Run 1	Run 2	Run 3
0	[Start]	0	0	0	0
771	Mainland	771	800	771	744
2425	Guilbeau	2425	2448	2420	2409
5057	Bresnahan/Mistic	5057	5045	5077	5049
7538	Braun	7538	7568	7505	7543
9960		9960	9960	9972	9949

Figure T4.6 — Run Distances

Note: See Tutorial 1 pages T1.7 to T1.10 for a brief overview of how you can edit the runs in the Run Details screen and then how you can manipulate the node distances on this screen.

The last few things you need to do are to add any notes, give the study a name, and then save it.

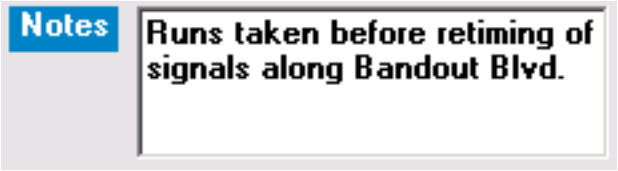

Figure T4.7 — Notes

Type any notes in the ***Notes*** window. Remember that whatever you type will be saved with the study and printed at the bottom of the Study Summary report. Ask yourself, "What would I want to remember about this study in 6 months that isn't obvious from the data?".

The study is just about ready to save. Check everything on the Study Summary screen. Make sure the ***Speed Categories, Normal Speed***, and ***Stop Speed*** are what you want for this study. You can change any of these parameters simply by editing the text boxes.

Figure T4.8 — Name Closeup

Finally, click in the far left corner of the ***Name*** text box at the top of the screen, and type in the name you want to give to this study. Make the name as descriptive as necessary so that you can tell what the study is about from the name alone. In this case, the name is simply the main road, Bandout Blvd., and the fact that these are the Before runs. The name will often, but not always, be an elaboration of the names of the runs in the study.

When you have entered the name in the text box, click on the **Save** icon on the toolbar, or select **File:Save Study Now** from the main menu.

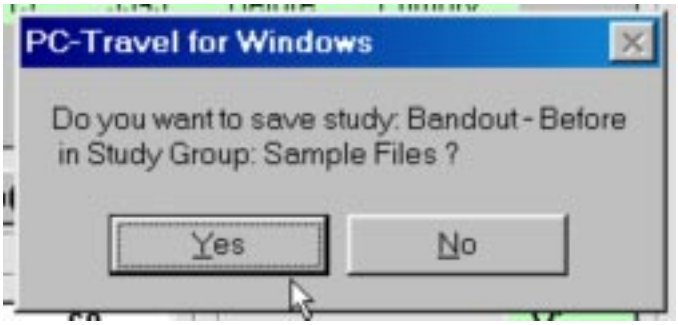

Figure T4.9 — Save Confirmation

A confirmation window pops up asking if you want to save this study. It shows the name of the study and the study group. Click on **Yes** to save the study. If you realize the name or the study group is wrong then click on **No**.

The study is now saved on your computer in the study group shown at the top of the screen. You can now view the data or print reports.

Summary

This tutorial gave you a quick introduction to the process of creating new studies. You saw how to Add existing runs to a blank study, edit the basic parameters for the study, and name and save the study.

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Tutorial 5

How to Edit Node Distances in Individual Runs

How to Edit Nodes in Individual Runs

Travel-time studies would be pretty simple to do and analyze if it weren't for the nodes; you could simply time how long it took you to drive from the start to the end of the route and that would be your travel time. But that doesn't give you enough information. You need to know the statistics on a node to node basis. That is how you find the intersections that are causing the biggest delays. But dealing with the node information is annoying at best. Not only do you have to be very diligent when you collect the data so that you press the New Link button accurately at each node, but you also have to type in the names of all of the nodes into the software so that the reports will make sense. This tutorial shows you how to use some of the advanced features in PC-Travel for Windows to edit the node distance names and distances in your runs, to make it as easy as possible.

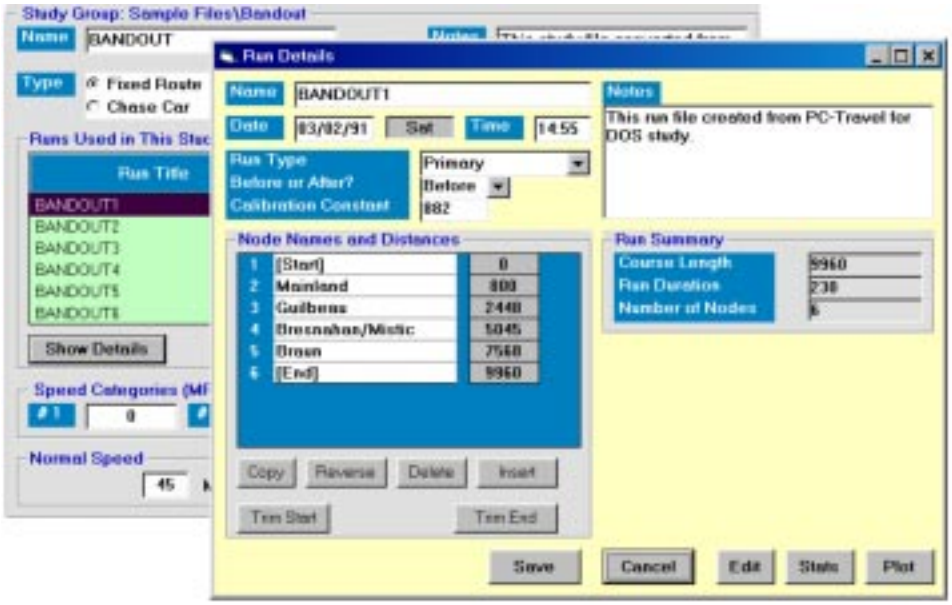

Figure T5.1 — Run Details

This is the ***Run Details*** screen. It shows just about everything we know about a particular run, including the node names and distances if this run is a Primary run *(remember, a Primary run is a run where you collected node distance information in the field and want to use it to find the node distances for the study).* Most of this screen has been discussed before, in ***Tutorial 1 - Introduction to PC-Travel for Windows*** *(see page T1.7)***.**

This tutorial will deal with the information shown in the lower left part of the screen, the window labeled **Node Names and Distances**. This is where you enter the names of the nodes, either by typing in the names *(but just once)* or copying the names from other runs *(the preferred method)*. You also can insert and delete nodes in the data, and trim the start or end of the run to make the nodes line up. These options will be explained in detail in a little while.

For this tutorial, just read the text. It isn't necessary to follow along on your computer. These operations permanently alter the runs, and that might confuse you if you then try to use the same runs in another tutorial.

In order for a study to analyze correctly, all of the runs in the study must start in the same place, end at the same place, and go in the same direction. This sounds simple, and usually is, but occasionally a mistake is made during a run and a node is missed, or an extra node is added, or the run is started at the wrong place. You could just ignore this run, but as you'll see, you may also be able to fix it.

The ***Node Names and Distances*** window in figure T5.1 has two sections:

The top shows the node names and distances. The Node Names section have a white background, which means you can edit the names simply by typing over the existing names. The distances have a gray background. Those values are calculated from the pulse data collected by the TDC-8, and can't simply be edited by typing over them *(although, as you'll see, there is a way to edit them).*

The bottom section has six buttons. This tutorial basically will explain how to use these six buttons.

There are three situations we will examine, each requires the use of one or more of these buttons:

Situation 1: Normal scenario where you enter the node names for runs you just downloaded from a TDC-8.
Situation 2: Your run has a missing or extra node and you want to fix it.
Situation 3: All of the runs were started and/or ended at different places *(which is ok).*

Situation 1: Normal scenario where you enter the node names for runs you just downloaded

There really are two parts to this situation. The first is processing the first run, where you have to type in the node names for the first *(and last)* time. The second is for other runs on the same route *(even those going in the opposite direction)*. We'll call these two parts 1a and 1b, respectively.

1a – First Run

The normal sequence with PC-Travel for Windows is the following:
• You do a study in the field and collect data in your TDC-8.
• You read the TDC-8 and create two study groups, each containing runs for one direction.
• You create a new study and add the runs from one direction.
• You enter the Run Details information for each run and re-save the run.

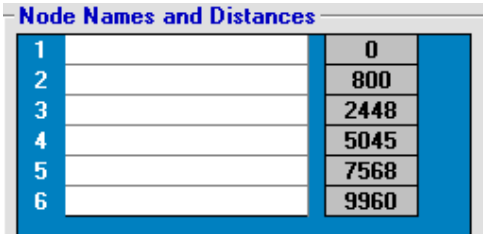

Figure T5.2 — Nodes Without Names

It is during this last item that you enter the node names. This screen shot shows what the screen looks like before you type in the node names. The distances are already there because they come directly from the data. Since this is the first run you are processing for this route, you need to type the names of the nodes. The first line, with a distance of 0 is where you started the run. The last line, with a distance of 9960, is where you ended the run. This is all standard and easy to do. Just click in the text box where you want to edit the name, and type in the name or edit the existing name.

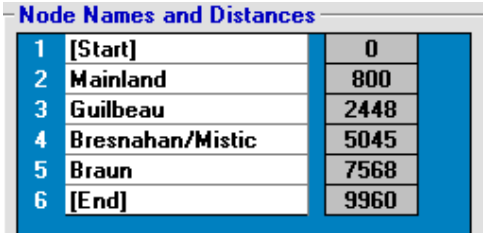

Figure T5.3 — Nodes With Names

You will end up with something similar to this. Once all of the names are entered, and you have edited the other information on the ***Run Details*** screen, click on **Ok** to save the run information. You now have one run with all of the node names entered; you won't have to type the names in again.

1b – Subsequent Runs

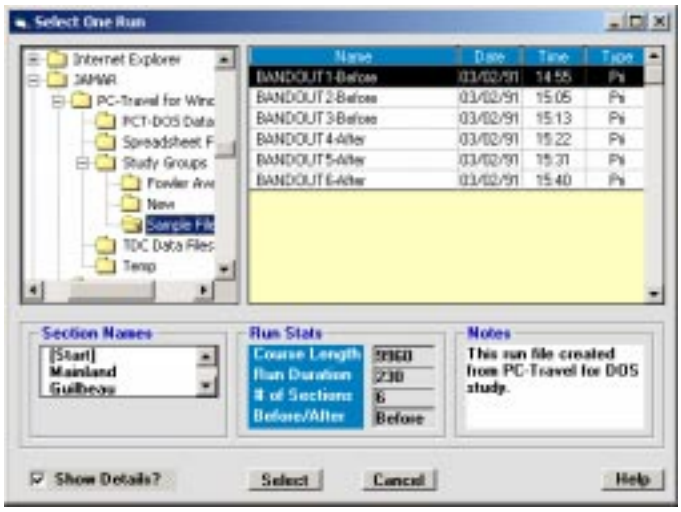

Figure T5.4 — Copy Node Names

Once you have typed in the node names once for a given route, you don't want to have to do it again, and you don't. You can copy the names from an existing run that has the same node names you want. Assume you are looking at the ***Run Details*** screen of a different run from the same study. Instead of typing in the node names, press the **Copy** button. A screen similar to the one shown here is displayed. It shows the list of runs in your study in the upper right hand corner window. The first run is highlighted, and if there are any node names assigned to that run, then they are shown in the lower left window. You want to highlight the run that has the node names you want then click on **Select**. You will then pop back to the ***Run Details*** screen with the node names copied to the appropriate fields. Then you can save the run.

You can follow a similar sequence when you create the second study with the runs going in the opposite direction, with a couple of minor additions. The first run of this new study will not have any node names yet. Instead of typing them in like you did the first time, you can copy the node names from a run from the first study group. You may need to navigate to another study group to find the run you want before you select the run. Once you are back in the Run Details screen, you will have the node names on the screen but they will be in the wrong order. Click on the **Reverse** button to flip the names from top to bottom. Save the run, and then you can follow the sequence in 1b described above for the rest of the runs in that study using this first run as the source for the node names.

Using the procedures described in 1a and 1b above, you can add node names to all of your runs, and you just have to type in the names once for each route.

Situation 2: Your run has a missing or extra node and you want to fix it

Sometimes, however, you may find that there are problems following the procedures outlined above because one or more of the runs don't have the proper number of nodes. It is easy to miss a node while collecting the data; you are busy driving and you may not hit the pushbutton properly so the node isn't entered. Or you may accidentally press the pushbutton when you shouldn't, which adds a node that doesn't belong there.

You have three options when you discover a run has the wrong number of nodes:
1 – Make the run a Secondary run, which effectively ignores the node information in the run.
2 – Adjust the run node distances on the Node Distances screen before finding the averages.
3 – Fix the node information in the run.

The first choice is actually the easiest and usually the best solution. ***The node distance information in any one run is only used to help find the average node distances for the study*** *(which is done in the Node Distances screen accessed from the Study Summary)*. All statistics found in the software use the study node distances. So, if you have a study with several runs, and one of the runs has bad node information, then the simplest solution is to change the run type to Secondary *(on the Run Details screen, see Fig T5.1)*. This tells the software to skip that run when it shows the node distances in the Node Distance screen, and the bad node information will not affect your data in any way.

The second choice works if you are missing one or two nodes in a run. With this option, you use the tools available in the ***Node Distances*** screen to adjust the node distances shown for the runs so that the nodes in the bad run line up with the equivalent nodes in other runs. This is explained in detail in ***Tutorial 6: How to Find Node Distances in Your Study***. This is also a perfectly good option.

The third choice is for when it isn't practical to use the first two choices. If your study only has 2 or 3 runs, then skipping one or two of them would make the averages of the node distances less accurate than you might like. If your run has extra nodes, then it isn't easy to use option 2. Or, you may just decide that you want the runs to be as accurate as possible. For these cases, you can almost always fix the bad runs so that the node information is accurate.

How to Delete A Node

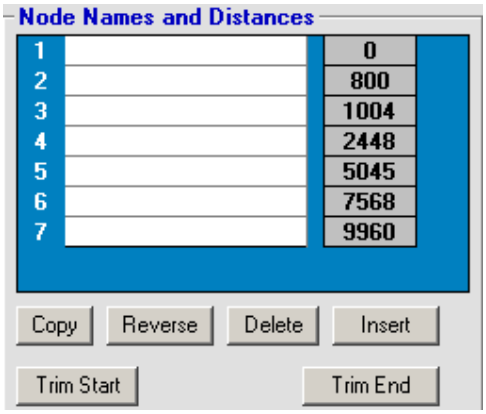

Figure T5.5 — Delete a Node

Assume that in one of your runs you accidentally hit the New Link button, which added an extra node to the data. When you go to the Run Details screen you see that instead of the expected six nodes, there is a seventh. A little comparison to the other runs makes it clear that the problem is the third node, at 1004 feet. That node shouldn't be there. There aren't any node names yet, since you want to have the proper number of nodes before you copy the names from another run.

Click on the text box in the third node line. Then click on the **Delete** button. The third line *(along with the distance)* disappears and there now are six nodes, which is correct. You can now copy the names from another run and proceed as normal. The software edited the data point that had the node information at 1004 feet and removed the node marker. When you save the run, you make the change permanent.

How to Insert a Node

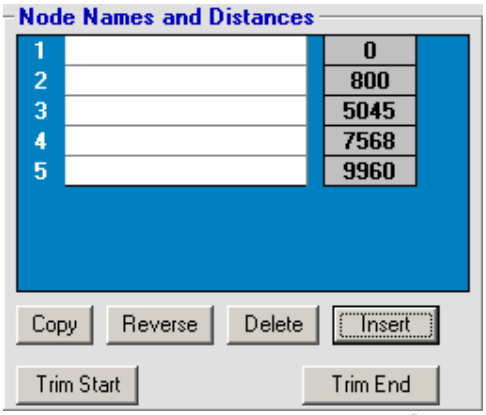

Figure T5.6 — Insert a Node

Assume that in one of your runs you missed a node. When you go to the Run Details screen you see that instead of the expected six nodes, there are only five. A little comparison to the other runs makes it clear that the problem is that the third node is missing; the other runs have a node around 2040 feet and this run doesn't. We can fix that.

Click on the text box on the third node line, then click on the **Insert** button. A new line, along with a blank distance, is inserted in the third node position.

We know the missing node is about 2040 feet from the start. Click on the blank white text box in the distance column and enter 2040.

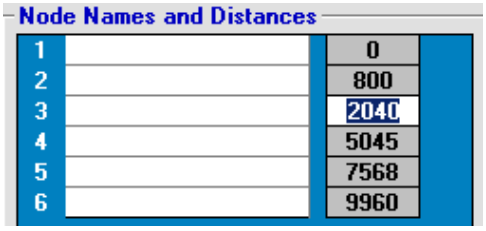

Figure T5.7 — Add Node Distance

You now have the proper number of nodes for this run, so you can copy the node names from another run and proceed as normal. When you save the run, you make the change permanent.

If you immediately go back to the Run Details screen you may see something that seems odd. The distance that you typed in, 2040, has changed to 2051. This is normal. In fact it is unavoidable.

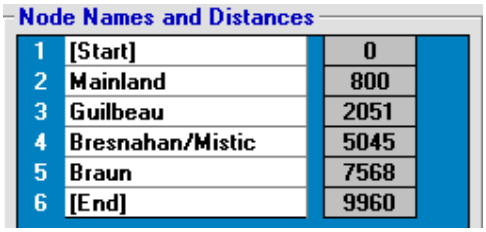

Figure T5.8 — Node Added

Remember that node markers are embedded in the pulse data, and that the pulse data is stored every second. The software can only find distances on a second by second basis. When you inserted a node and typed in the distance, the software searched for the data point that contained the distance you entered. It then added a node marker to that data point. Later, when the software scanned the pulse data to find the node distances, it found the new marker, but used the only distance it knew, the distance traveled up to that point, as the node distance. This probably doesn't exactly match what you entered. But it is as close as the system allows, and normally is more than accurate enough. *(For a more complete discussion of how distances are measured, see Appendix 2).*

Situation 3: All of the runs were started and/or ended at different places (which is ok)

The first two situations discussed dealt with handling mistakes that were made while collecting travel time data, specifically missing nodes or adding nodes. The third situation deals with editing runs that are done using a data collection procedure that is fairly common, but could cause problems if not handled properly.

One of the primary requirements for a successful travel time study is that all of the runs must start at the same place. All distances in PC-Travel for Windows are calculated from the start of the run. If the starting point of each of the runs in a study varies, then the study statistics won't make any sense.

You start a run by pressing the DO button on the TDC-8. Most users set up their route and add a node *(usually an intersection)* before and after the main route. They start each run at the start node and end each run at the last node. Since each run starts at the same place, everything is fine.

To start the run at the first node, you really have to be driving at the proper speed some distance in advance of the first node when you start the run. It is a little easier to press the New Link button, which is in your hand and doesn't require you to take your eyes off the road, than the DO button on the counter. For this reason, some users, especially those who have used PC-Travel for DOS, like to start the run without the requirement that the driver press the DO button exactly at the right place. The idea is that the driver starts the run anywhere in advance of the first node of interest, then accurately marks the nodes using the New Link button, and then ends the run anywhere after the final node of interest.

In PC-Travel for DOS, the software had a feature called ***Ignore First Link*** and ***Ignore Last Link***. If the ***Ignore First Link*** was chosen, the analysis software didn't start the run where the user pressed the DO button, but rather with the first node. Similar logic was used for ***Ignore Last Link***. This feature was used by only a small percentage of users, but caused a lot of confusion. It was left out of PC-Travel for Windows.

However, the idea of starting and ending the runs somewhat randomly has some merit, if only from a safety point of view, so we wanted to support those users who wanted to collect data that way.

If you start a series of runs at different places, but always have the first link at the same place, then essentially you want the software to ignore the data from the start of the run to the first node. Instead of ignoring it, we let you delete it. This is where the **Trim Start** and **Trim End** buttons are used.

How to Trim Runs

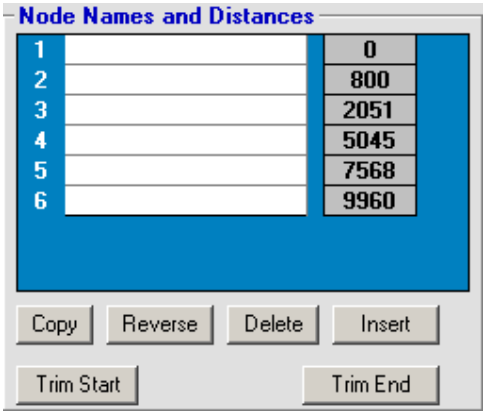

Figure T5.8 — Trimming Runs

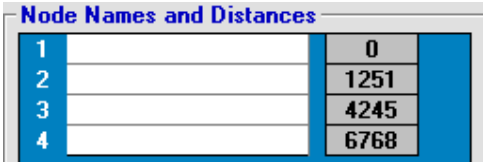

Figure T5.9 — Trimmed Runs

Assume you have collected data as discussed above, so that the first node distance varies from run to run in this study. Also, the last node distance isn't important either because it varies from run to run. This is shown in the first screen shown here.

Click on **Trim Start**. The first node line is erased and the distances adjusted so that the first node starts at zero. The software deletes all of the data points from the start of the run up to the data point with the first node marker.

Click on **Trim End**. The last node is erased. The software deletes all of the data points from the end of the run back to the data point with the last node marker.

You need to do this for each of the runs in the study. All of the runs now start and end at the same place.

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Tutorial 6

How to Find Node Distances in Your Study

How to Find Node Distances in Your Study

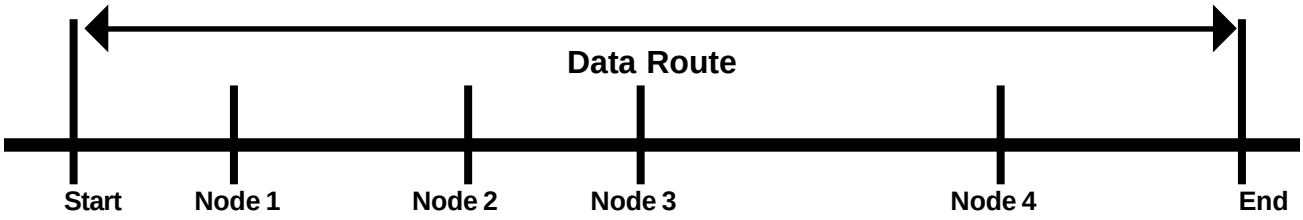

Figure T6.1 - Typical Route with Nodes

Nodes are an important concept in PC-Travel for Windows. Every study, like the runs that it is made from, starts at one well-defined point and ends at another, and usually has nodes in between *(see Figure T6.1)*. These nodes are usually cross streets, but can be anything that is easy to see while you are driving.

The program needs to know the names of each of the nodes and the distance that each node is from the starting point. Various statistics are calculated, displayed, and printed in the reports not just on the entire route, but on a node to node basis as well.

Since node names and distances are so central to the operation of the software, it is important that you understand how you find the most accurate distances for your studies *(the names don't cause much confusion)*. That is the purpose of this tutorial. You will learn how to find the best possible node distances for your study. Before you get to the software, however, you need to understand some of the concepts involved.

There are basically two methods you can use to find the node distances:

1 – Collect node distance information while you do the travel time runs by pressing the **New Link** button as you pass each node point during a run.

2 – Measure the node distances accurately in some way independent of the travel time data collection, and then manually input the distances into the software.

Since the first option is by far the most common method used, it will be discussed first.

Use Node Data From Runs

You may ask, "What's the problem? I drive the route and press the **New Link** button at each node. The software should be able to calculate the node distances from the run data." Basically, this is true. But there are two problems. One is the fact that the node distances found from the data stored in the TDC-8 are not very accurate. *Appendix 2 — How Distances are Measured* explains this in detail. The second is that the nodes are recorded by people, who don't always press the **New Link** button at the proper place *(and sometimes forget to press the button at all)*. The result is that the node distances for any one run are often inaccurate.

Since a typical travel time study requires multiple runs, you have multiple opportunities to measure the same node distances. Assume you did five runs in a row. You pressed the **New Link** button at each node during each run. There is some error in each node distance caused by the inherent error in the way the distances are stored in the TDC-8, plus the error associated with you trying to push the button at exactly the same place each run. Each node distance may have some error inherent in the measurement, but the *average* of the five node distances is probably pretty accurate, or at least more accurate than any one run you might pick.

The idea of averaging the node distances from all of the runs is the basis for the ***Node Distances*** screen used in PC-Travel for Windows. The more runs there are that have node distance information, the more accurate the averages will be. This leads to two of the fundamental rules for collecting good travel data:

1 – Press the New Link button at each node on every run you do. This is fairly easy to do. You are out there anyway, so you might as well collect the node information for each run.

2 – It is better to not hit the New Link button at all for a node, then to hit it several seconds late. Sometimes it is impossible to press the button just when you want to, especially if you are doing the study by yourself; the traffic may keep you busy as you pass the node. Just skip the one node. You'll probably have several measurements for that node by the end of the day. However, if you know you mis-timed a node, make a note on your field sheet at the end of the run so that you can deal with it later back in the office.

When you read and process the data in the TDC-8, you create runs from the data and store them in a Study Group. You edit the parameters of each run in the Run Details screen *(See page T1.7)*. If you designate the run as a Primary run *(which only means that you collected node information in the field and you want the software to use it)* then the run has node names and distances for you to enter or edit. The names are entered manually or copied from other runs. The distances are found from the pulse data collected in the TDC-8. Occasionally you need to fix bad node information in the run. ***Tutorial 5 — How to Edit Nodes in Individual Runs*** explains how to do this. When you save the run details, the node information is ready to be used in a study.

Once the runs are created and edited as needed, you create a study using some or all of those runs. Before the software can find the statistics for the study, which include statistics on a node-to-node basis, it has to find the node distances that will be used in that study. That is done, with your help, on the ***Node Distances*** screen.

First, you need to run the software and open a study so you have data to use.

1 – Run PC-Travel for Windows and from the **Startup Options** screen, select ***Open Existing Study***.
2 – If necessary, navigate to the **Sample Files** study group.
3 – Click on ***Bandout-Mixed Runs*** from the list and then click on **Select**. You'll see the ***Study Details*** screen as shown below in Figure T6.2.

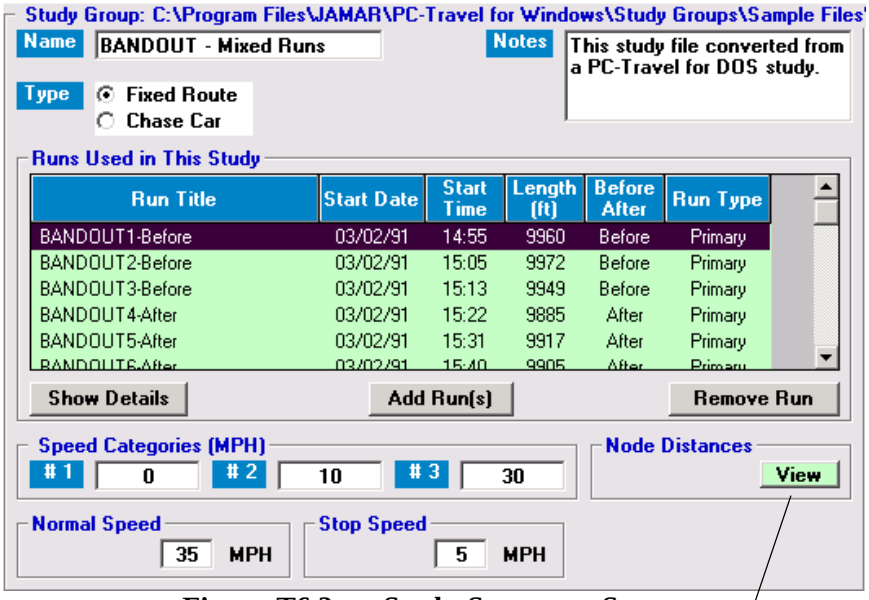

Figure T6.2 — Study Summary Screen

4 – Click on the **View** button in the ***Node Distances*** window. This will bring up the Node Distances screen.

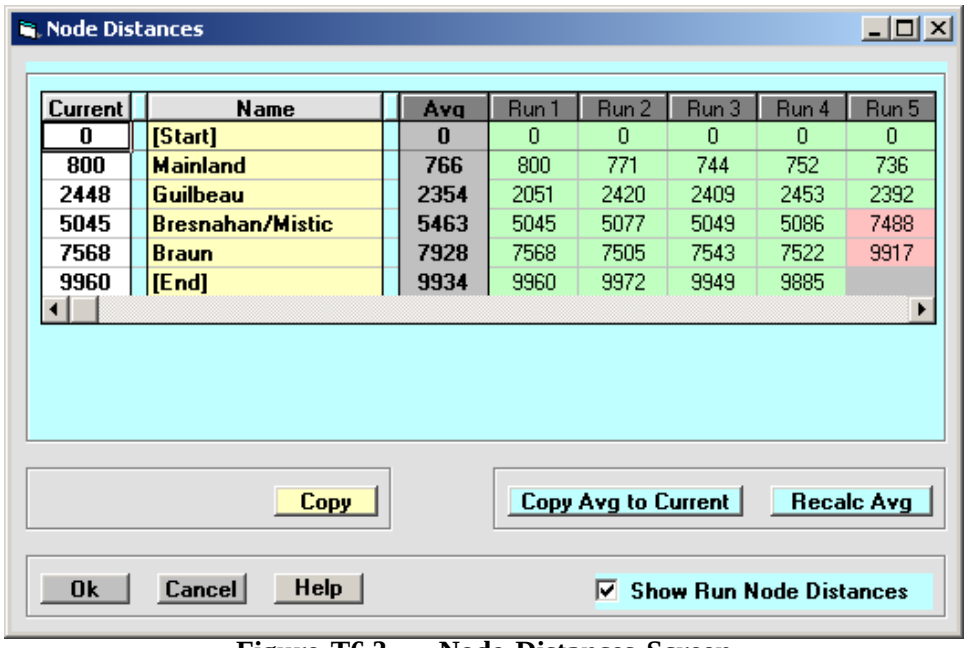

Figure T6.3 — Node Distances Screen

The ***Node Distances*** screen shown above shows the **Names** of the nodes and the **Current** distances assigned to each node for this study on the left side of the screen. ***Ultimately, the only thing that matters is that the Current column has the best possible distances.*** The names and distances default to the values of the first Primary run. The distances are often close enough to use. However, these rarely are the *best possible* distances. There are several ways to get these better distances.

The right hand side of the Node Distance screen shows the node distances for each of the Primary runs in the study. The **Avg** column is the average of all of the run distances in that row. In this case, there are six runs *(only five are visible without scrolling).*

Notice that most of the numbers have a green background, and two have red backgrounds. Each number should be close in value to the other numbers in the same row, since they represent the attempt of the data collector to mark the same node. The software compares each distance to the value in the Avg column. If the two distances are close *(within 500 feet by default, but you can change this in the Preferences screen, see Appendix 1)* then it shows a green background. If it isn't close, then it shows a red background.

Look at the two red values in Run 5. It is pretty clear what happened here. The data collector missed the node at Bresnahan/Mistic. This makes the other two distances below that node out of place. The 7408 that is now in the Bresnahan/Mistic space should be in the Braun row, and the 9917 should be in the [End] row.

> ***Note:*** *When this run was first created, the missing node could have been inserted in the Run Details screen; then this screen would have all green entries. Alternatively, you could go back to the Run Details screen for run 5 and set the type to Secondary. Then the run wouldn't show up on this screen at all. You usually have several different options available to you to deal with bad or missing nodes. The best option is the one that gives the software the most node distance data points to average, since that will give the most accurate results. Therefore, as the best option we always recommend fixing the runs by inserting or deleting nodes as needed. As the next best option, adjust the node distances on this screen as shown in this tutorial. Finally, if all else fails, make the run a Secondary run. This is the least desirable since it eliminates all of the node distances for that run from the averaging operation, not just the one or two bad ones.*

Assume that you don't want to fix the run, but you want the distances that are out of place to be put where they belong. You can do this easily. Just follow along:

Avg	Run 1	Run 2	Run 3	Run 4	Run 5
0	0	0	0	0	0
766	800	771	744	752	736
2354	2051	2420	2409	2453	2392
5463	5045	5077	5049	5086	7488
7928	7568	7505	7543	7522	9917
9934	9960	9972	9949	9885	

Avg	Run 1	Run 2	Run 3	Run 4	Run 5
0	0	0	0	0	0
766	800	771	744	752	736
2354	2051	2420	2409	2453	2392
5463	5045	5077	5049	5086	7488
7928	7568	7505	7543	7522	
9934	9960	9972	9949	9885	9917

Avg	Run 1	Run 2	Run 3	Run 4	Run 5
0	0	0	0	0	0
766	800	771	744	752	736
2354	2051	2420	2409	2453	2392
5059	5045	5077	5049	5086	
7523	7568	7505	7543	7522	7488
9931	9960	9972	9949	9885	9917

Figure T6.4 —
Select and Move Node Distances

1 – Click on the number 9917. A solid border appears around the cell.

2 – Point the cursor at the bottom of the cell, right on the line. The cursor will change from a cross to an arrow.

3 – Press and hold the left mouse button and drag the cell down one cell and let go of the mouse button.

4 – The 9917 cell is now one row lower.

5 – Repeat steps 1-4 with the number 7488.

We now have the distances in the proper rows. There is a blank entry, but that is ok. The software will ignore it.

Click on **Recalc Avg**. The values in the **Avg** column change, and now all of the numbers have a green background.

Click on the **Copy Avg to Current** button**.** The values in the **Current** column now match the **Avg** column. These values are now the best we can get from our data, and are probably more accurate than just choosing the distances in any one run.

When you are happy with the values in the **Current** column, click **Ok**. If you get the distances all messed up, just hit **Cancel** to go back to the ***Study Summary*** screen without making any changes.

The new distance values in the **Current** column are not a permanent part of the study yet. If you want to save the new values with the study, then click on the **Save** icon in the ***Study Summary*** screen. The new distances, plus any other changes to the study you have made, are saved.

This whole procedure may seem a little cumbersome, but if you don't want to fiddle with the node distances you usually don't have to. If you prepare the runs properly you will see only green values when you first see this screen. If there are some red values, you still have several options. You can go back and fix the runs that are causing the problems, which is probably the best option. You can make one or more of the runs Secondary runs so that they don't show up on this screen. Or you can use the procedure described here to move the distances around so that the distances are in the correct rows.

You can't solve all bad node problems by moving node distances around. If you have a run with an extra node, then you really need to fix it by deleting the node in the ***Run Details*** screen. Also, if there are the proper number of nodes, but the distance is way off because the driver hit the button very late, then you also need to fix that in the ***Run Details*** screen. However, the most common problem is a missing node, which is easy to adjust for on this screen.

Please realize that you are not permanently altering the node data in the runs in any way. All you are doing is temporarily moving the node distances to different rows *on this screen* so that you can find the best possible average distance for that node. The only way to permanently fix node problems is in the ***Run Details*** screen.

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Tutorial 7

How to Edit Sensor Data

How to Edit Sensor Data

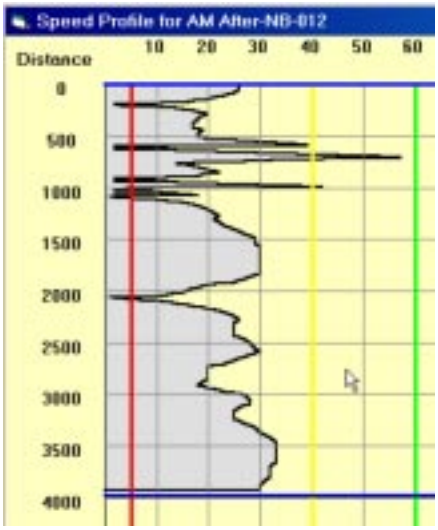


Figure T7.1 — Problem Sensor Data

There may be times when your data needs editing. Usually there is an apparent problem with one of the graphs. Instead of the nice smooth variations in speeds that you normally see, you see uneven jumps, as shown in this screen shot of a Speed Profile for a run *(which you can see by clicking on the **PLOT** button on the **Run Details** screen).* This is real data sent to us by a user. It is pretty clear that something weird is happening in the 500-1000 foot range. The rest of the graph looks fairly typical. There is a normal looking slow to a stop, probably at a stop light, at the 2000 foot mark. The rest of the graph looks ok. Still, that funny looking data is likely to cause the statistics to be off.

This tutorial will show you how you can edit the sensor data in your runs to eliminate some problems you might find. This is a read-along tutorial, you don't have to follow-along on your computer.

Let's take a closer look at the sensor data that makes up this run.

In the ***Run Details*** screen, instead of the **PLOT** button, you click on the **EDIT** button**.**

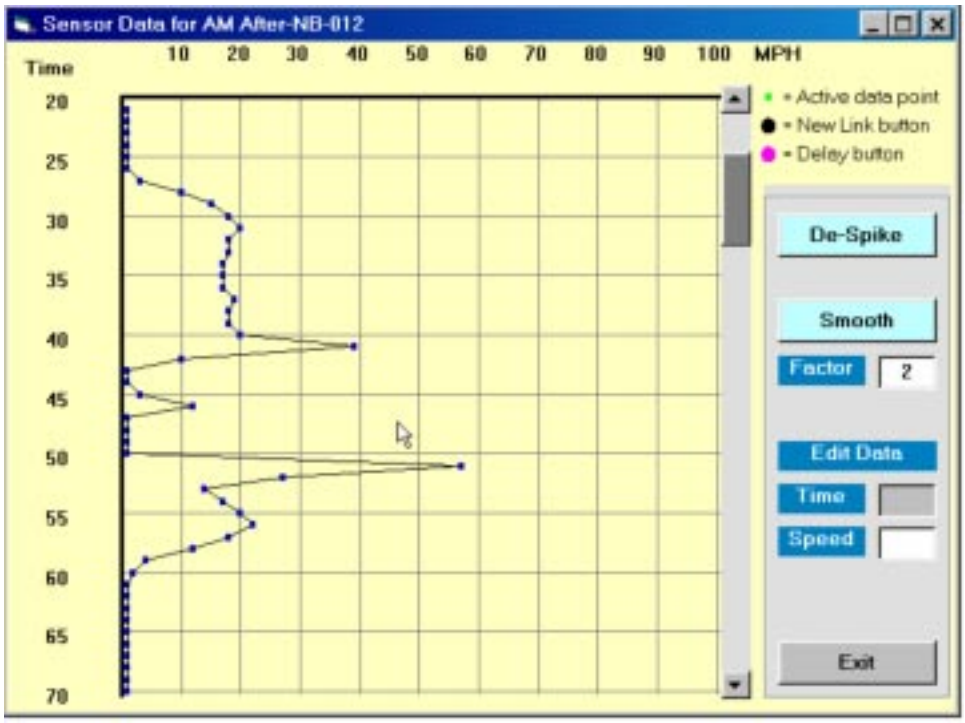


Figure T7.2 — Edit Sensor Screen

This is the Edit Sensor screen. The graph is a Speed vs Time plot of the sensor data collected in the field during one run. Each data point is one second of data. You can scroll through the data using the scroll bar. The graph shows 50 seconds of data at a time.

Here you can see that there is a sharp spike at 41 seconds, a small spike at 46 seconds, another large spike at 51 seconds, and another small spike at 56 seconds. The rest of the data on this screen looks ok.
We know that cars can't go from 20 MPH to 40 MPH in one second, so there clearly is a problem here**.** The first impulse might be to distrust all of the data and go back and re-do the data collection. You don't necessarily have to do this, however. You might be able to edit the data so that it is usable.

> ***Note: When you modify the data using the options on this screen you are modifying a copy of the data stored in the run. To make the changes permanent you must click on the SAVE button on the Run Details screen, which is where you go when you exit this screen. You also might add a note to the run before you save it to explain that the data was edited.***

The Edit Sensor screen gives you three ways to modify the data:
1 – De-Spike
2 – Smooth
3 – Edit individual data points.

De-Spike Data

The De-Spike option is very simple. When you click on the **De-Spike** button, the software scans through the data looking for patterns that look like spikes.

A ***spike*** is defined as a 3 consecutive data points, S1, S2, & S3, that have one or more of the following characteristics:
1 – S2 - S1 > 20 *(MPH)*
2 – S2 - S1 > 10 AND S3 - S2 > 10 *(MPH)*

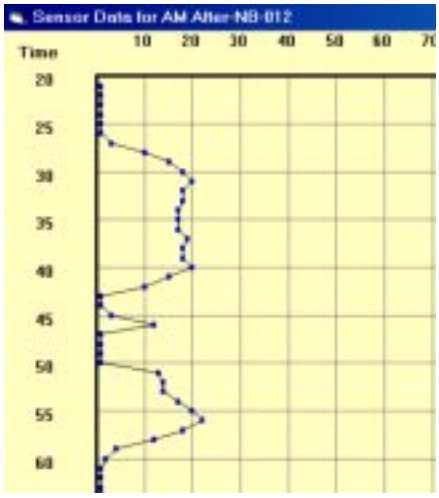


Figure T7.3 — De-Spiked Data

These definitions may change as we get more experience with real data.

The software scans through the data. When it finds a spike, it replaces the middle data point *(S2)* with the average of the other two points. The software then continues on until all of the data has been scanned. The graph is then updated to show any changes.

Figure T7.3 shows how the data in Figure T7.2 looks after it has been De-Spiked. Notice the spikes at 41 seconds and 51 seconds are gone. There still is a little spike at 46 that looks a little odd. This can be taken care of with either of the other two editing options, smoothing, or actual editing of the data points.

Smooth Data

Sometimes the data looks a little *jerky*, instead of nice and smooth like it should. After all, cars make fairly smooth transitions from one speed to another, the large mass of the car makes it difficult to do anything else. If you smooth out the data a bit, it will more closely represent what the car was actually doing on the road.

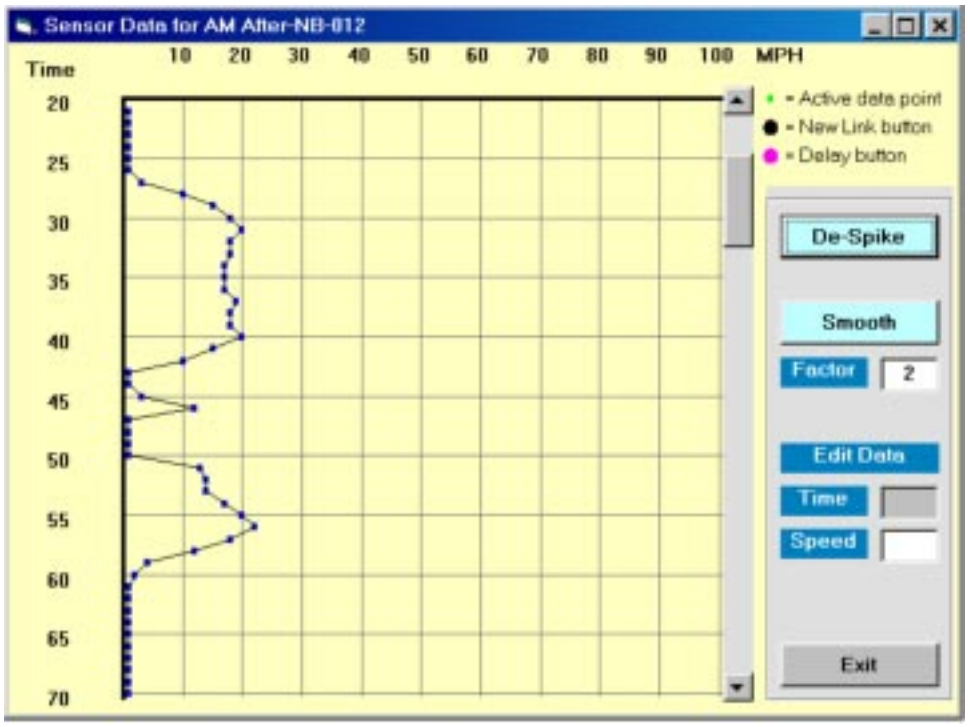


Figure T7.4 — Sensor Data Before Smoothing

Smoothing Factor

Notice that below the **Smooth** button is a text box labeled ***Factor***. This setting tells the software how much smoothing should be done. The lower the setting, the greater the smoothing effect. The default is 2, which seems to work reasonably well, but you can change it as you see fit. Values above 5 don't do much at all. A value of zero will smooth every point. The factor essentially tells the software how much of a difference there must be between consecutive data points before a point should be smoothed.

When you click the **Smooth** button, the software scans through the data and finds the difference in speed between consecutive data points. If it is greater than the Smoothing Factor, then that point is set to the average of the two points around it. The software then continues through the data until all of the data has been scanned. The graph is then updated to show the new data values.

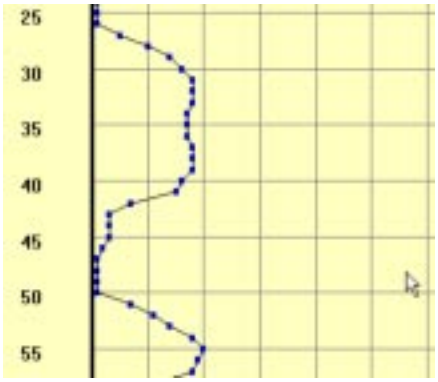


Figure T7.5 — Smoothed Data

This screen shot shows the result of smoothing the data *once*, with a setting of 2. Notice how much, well, *smoother*, the data looks. That annoying little spike at 46 seconds is also gone now.

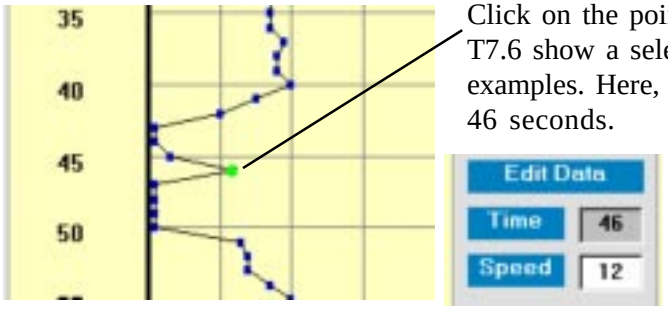
You can run the smoothing routine several times. Just click on the Smooth button again. The software will make another pass through the data and smooth points as needed.

You also can change the Smoothing Factor and continue to smooth the data. But be careful, if you do too much smoothing, the speed profile can change significantly. Like many things, a light touch is best.

Edit Data

If you only have a few data points that don't seem right then you can directly edit those points.

To select the data point to edit:



Click on the point you want to edit. The point turns green. Figure T7.6 show a selected point from the same data we used in the other examples. Here, we're going to get rid of that little spike in the data at 46 seconds.

Notice the text box labeled ***Speed*** now shows the number 12, which is the speed of the point shown in green. The ***Time*** shows 46. The box is in gray because you can't edit that number directly.

Figure T7.6 — Selected Data Point and Values

To edit the data:

Click on the Speed text box and type in the new speed you want. Press the Enter key when the speed is the value you want. The graph updates to show the data point at the new value.

Or

Click on the green point, hold the left mouse button down, and drag the point to the new speed value, then release the mouse button. The Time and Speed boxes now show the new values.

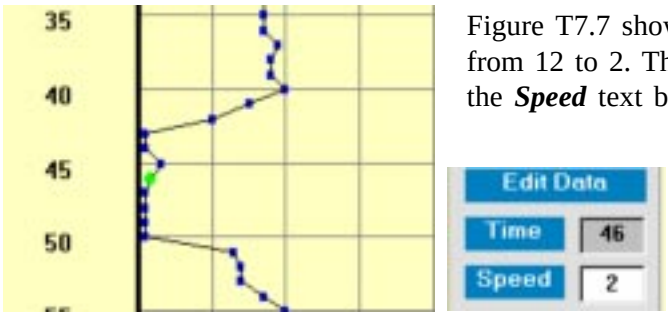


Figure T7.7 shows the graph after editing the data point at 46 seconds from 12 to 2. The graph now looks a little more realistic. The value in the ***Speed*** text box now shows the new value.

You can use this option to clean up the occasional data point that seems out of place.

Figure T7.6 — Edited Data Point and Values

How Does Data Get Spikes?

You might reasonably ask, "How does data get spikes like these in it?". The answer is it doesn't, unless there is a problem with the sensor, or with the way the sensor is installed.

The transmission sensor picks up signals that are designed to go to the speedometer electronics of your car. The sensor sends those signals *(through wires)* to the sensor electronics where the signal is amplified, conditioned, and passed on to the TDC-8.

Assuming everything is working properly, if 10 pulses are detected on the speedometer cable, then 10 pulses are delivered to the TDC-8 *(it's not quite that simple, but for the sake of this argument, pretend it is)*. All the TDC-8 knows is that it is supposed to count the number of pulses, so if extra pulses are added to the 10 pulses, it has no way of knowing.

It is a sad fact of electronics life that all wires are small antennas, radiating signals and receiving signals from all of the other wires in the area. It is also a sad fact that a car is a great source of spurious electronic noise that can easily be added to the signals traveling through wires if the wires aren't installed properly.

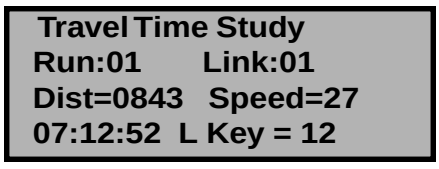
When you see data like the data in Figure T6.1, you can be almost certain that electrical noise from something in the car is being coupled into the signal going to the TDC-8. This causes the TDC-8 to count more pulses than it should, which makes the speed for that second too high.

If the sensor is installed properly, according to the directions included with the sensor installation kit, then you won't see problems like this. But it is easy to make little mistakes installing the kits. Make sure all of the connections are well made. If you use terminal blocks, make sure the screws are tight on the terminal block and that the wires are crimped properly to the spade lugs. Sometimes re-routing the wires will reduce the amount of noise coupling into the cables.

How can you avoid noisy sensor problems?

First, make sure you install the sensor kit properly. Follow the directions carefully.

Second, test the sensor before you collect any critical data. A good way to test the sensor is simply to drive around with the TDC-8 connected to the sensor. Set the TDC-8 to Travel Time mode as if you were doing a run. The display shows the current speed, among other things, as shown in the image here. The speed display usually lags a little bit when you speed up or slow down, but it should track the speedometer on the car fairly closely. You shouldn't see wild variations in the speed; this may be an indication of a problem with the sensor.



Summary

There is a good chance that you will never need to edit your sensor data. Usually the data coming into the TDC-8 is very clean. However, it is nice to know that if you do develop a noisy sensor, or a bad connection, or whatever causes the data to have spikes or jitter, that you have a way to clean up the data so that you can use the data to produce accurate travel time studies. Don't ignore the source of these problems even though you can clean them up in the software. Find the cause of the problem so you won't have to use this option at all.

Tutorial 8

How to Export Study & Run Statistics to a Spreadsheet

How to Export Study & Run Statistics to a Spreadsheet

PC-Travel for Windows has extensive report options but some users may want to be able to generate their own reports or use the data calculated by the software in another program. To help these users, the software has an Export to Spreadsheet option, which allows you to export the study and/or run statistics into one of two file formats: a Microsoft Excel spreadsheet file (.xls), or a generic tab delimited text file which can be used with most spreadsheet, database, or custom designed programs. This tutorial will show you how to export a study using a sample study included with the software.

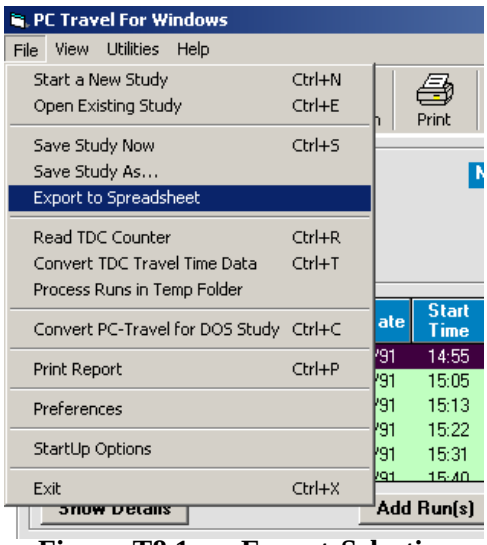


Figure T8.1 — Export Selection

1 – Run PC-Travel for Windows and select **Open Existing Study** from the Startup Option screen.

2 – Navigate to the Study Group Sample Files and select the BANDOUT study.

3 – Select **Export to Spreadsheet** from the **File** menu in the ***Study Summary*** screen *(see Figure T8.1)*.

You will then see the screen shown in figure T8.2 below.

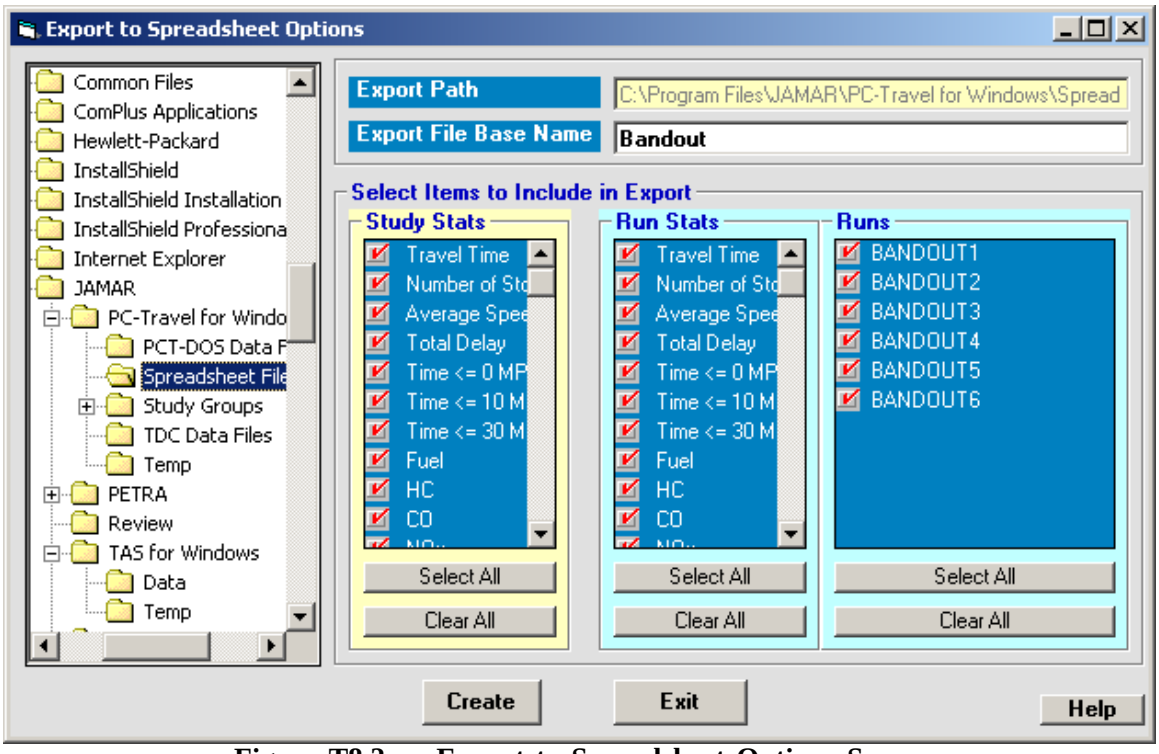


Figure T8.2 — Export to Spreadsheet Options Screen

There are several parts to this screen, and each part will be explained in the next few sections. This screen allows you to choose the destination folder for the spreadsheet files, the base name of the two spreadsheet files you can create, as well as choose which study and run statistics to export. For example, if you aren't interested in the fuel and emissions statistics then you don't have to include them in the exported data.

Export Path

The window on the left side of the screen shows the familiar folder tree which is used in many of the screens in PC-Travel for Windows. The current export path folder is highlighted *(the folder icon is shown in an open position)*. This is the folder where the exported spreadsheet files will be stored. The text box window labeled **Export Path** at the top of the screen shows the complete path to this folder. You cannot edit this text window, it simply shows you the path to the folder that is highlighted in the tree.

The default value is the value stored in the Preferences screen. If you change the export path, then the new path will become the default path the next time you run PC-Travel for Windows.

You can set the path to point to any folder on your computer. However, the folder you want must already exist; you can't create a new folder on this screen. Simply navigate to the folder you want to use on the tree and then click on the folder. The name in the Export Path text box will change to show the new path.

For this tutorial, just keep reading. Don't change the export path.

Export File Base Name

The Export to Spreadsheet normally creates two separate files, one for the study statistics and one for the run statistics. Each file will have the same base name *(the first part of the file name)*. The study statistics file will be named ***<Base Name>- Study Stats.*** The run statistics file will be named ***<Base Name>- Run Stats.***

The default base name is the name of the study. This is shown in the text box labeled **Export File Base Name** when you first see the screen. You can edit the base name to anything you want if you don't want to use the study name. Just click in the text box and edit the name as desired. However, for this tutorial, we'll accept the default name, so just leave it alone.

Select Items to Include in Export

We tried to give you as much flexibility as possible when exporting study and run stats. To that end you can select only those statistics you want to include with the exported data. You can select which study stats to include, you can select which run stats to include, and you can select which runs from the study to include.

The first two windows show the eleven statistics that are calculated in PC-Travel for Windows. The third window shows the list of runs that are in the current study.

Simply click on the statistic or run name to either select it or de-select it.

The **Select All** and **Clear All** buttons let you select *(with a check)* or clear *(no check)* all of the statistics or runs in that window.

If you are following along with the tutorial: the **Export Path** and **Export File Base Name** are set to the default values displayed when you first see this screen. Let's suppose we want all of the statistics included in the exported files. Click on the three **Select All** buttons so that there are checks next to each statistic and run name. Now click **Create**.

Note: The software remembers which statistics you selected and will place checks on those stats the next time you display this screen. If you rarely want to include fuel or emissions stats, for example, you won't have to check or uncheck the stats each time you export data. Since the number of runs varies from study to study, the run information is not stored; the software assumes you want to include all of the runs in the run stats and sets the check marks accordingly.

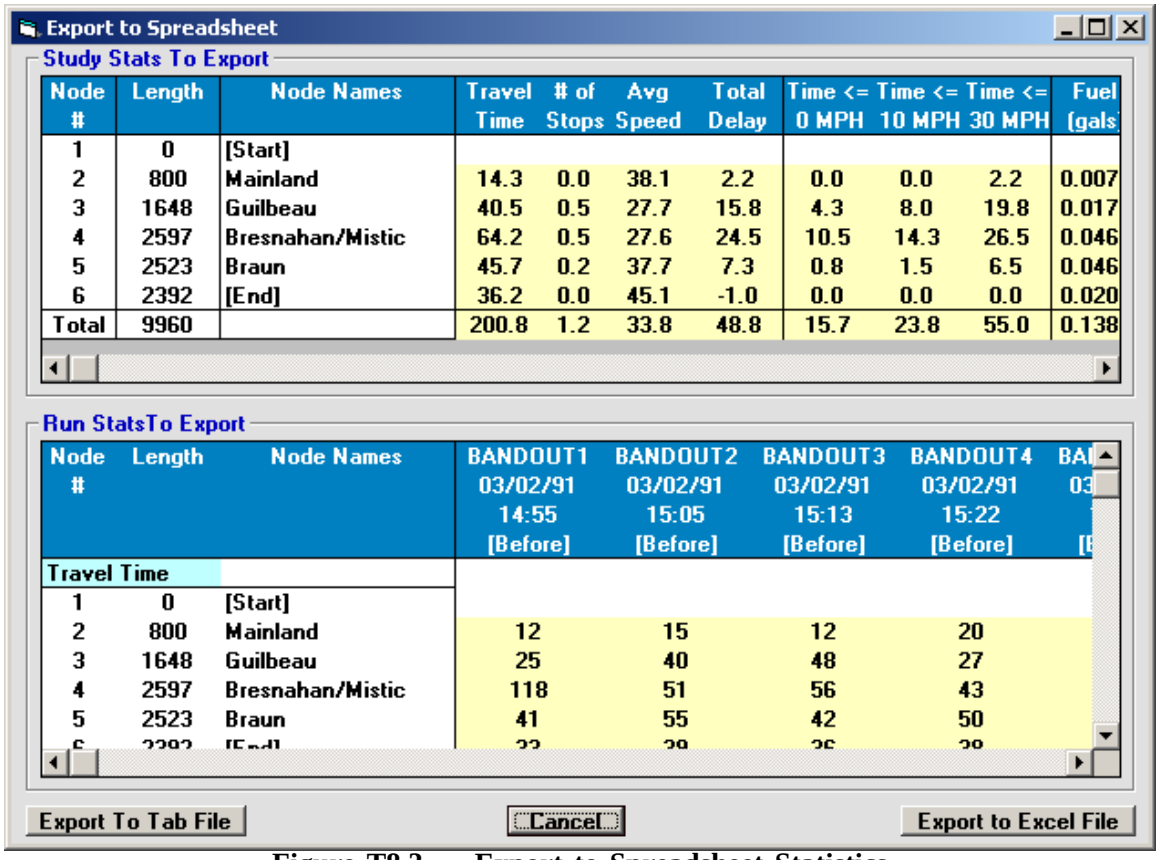


Figure T8.3 — Export to Spreadsheet Statistics

Figure T8.3 shows the results after you clicked the **Create** button on the previous screen. The software creates two spreadsheets; the Study Stats are shown in the upper window and the Run Stats are shown in the lower window. Only the stats you selected are shown. You can scroll through the two spreadsheets to make sure you have included everything you meant to include *(and just as important, haven't included stats you didn't want)*.

The **Study Stats To Export** format is essentially identical to the format you see in the other parts of the software where the study stats are shown, specifically the View Study Stats option and the Overall Study Stats report option. The nodes are listed down the screen. The various statistics go across the screen. These are the averages over all of the runs in the study. The last line shows the totals.

The **Run Stats To Export** format is a little different from other parts of the software. The top of the spreadsheet shows the name, date, time, and type *(Before or After)* for each run selected for export. Below this, each run statistic selected has a section where the nodes are listed down the screen and the stats for that node are shown going across the screen, under the appropriate run. If you selected all 11 run stats then there will be 11 sections going down the screen. Each section is labeled to show what statistic is shown.

There are three buttons at the bottom of the screen:

Cancel Click this to exit this screen, either after you have exported the files you want, or if you realize you made a mistake and don't want to export files yet.

Export to Tab File Click this if you want to create tab delimited text files.

Export to Excel File Click this if you want to create Excel files.

For tutorial followers: Click both of the Export... buttons. The software creates the appropriate files and displays a message confirming the export files were created successfully. If there is a problem with the export, then an error message is displayed.

Study & Run Stats: Excel Format

Node #	Length	Node Names	Travel Time	# of Stops	Avg Speed	Total Delay	Time <= 0 MPH	Time <= 10 MPH	Time <= 30 MPH	Fuel (gals)	HC (gr)	CO (gr)	NOx (gr)
1	0	[Start]											
2	800	Mainland	14.3	0.0	38.1	2.2	0.0	0.0	2.2	0.0073	0.6491	8.4385	0.3933
3	1648	Guilbeau	40.5	0.5	27.7	15.8	4.3	8.0	19.8	0.0178	1.7398	17.4961	1.1285
4	2597	Bresnahan/Mis	64.2	0.5	27.6	24.5	10.5	14.3	26.5	0.0469	3.9732	59.8937	2.6248
5	2523	Braun	45.7	0.2	37.7	7.3	0.8	1.5	6.5	0.0463	3.8942	66.6312	2.6939
6	2392	[End]	36.2	0.0	45.1	-1.0	0.0	0.0	0.0	0.0202	1.6078	23.1407	0.9634
Total	9960		200.8	1.2	33.8	48.8	15.7	23.8	55.0	0.1385	11.8640	175.6002	7.8038

Figure T8.4 Study Stats in Excel

Node #	Length	Node Names	BANDOUT1 03/02/91 14:55 [Before]	BANDOUT2 03/02/91 15:05 [Before]	BANDOUT3 03/02/91 15:13 [Before]	BANDOUT4 03/02/91 15:22 [Before]	BANDOUT5 03/02/91 15:31 [Before]	BANDOUT6 03/02/91 15:40 [Before]
Travel Time								
1	0	[Start]						
2	800	Mainland	12	15	12	20	12	15
3	1648	Guilbeau	25	40	48	27	42	61
4	2597	Bresnahan/Mistic	118	51	56	43	61	56
5	2523	Braun	41	55	42	50	39	47
6	2392	[End]	33	39	36	38	34	37
Total	9960		229	200	194	178	188	216
Number of Stops								
1	0	[Start]						
2	800	Mainland	0	0	0	0	0	0
3	1648	Guilbeau	0	0	1	0	1	1
4	2597	Bresnahan/Mistic	2	0	0	0	1	0
5	2523	Braun	0	1	0	0	0	0
6	2392	[End]	0	0	0	0	0	0
Total	9960		2	1	1	0	2	1

Figure T8.5 Run Stats in Excel

The two figures shown above display how the study and run stats that were exported in Excel format look when opened in Excel. You need to clean up the formatting of the cells a bit before they look exactly like this, but presumably you know how to do this *(probably much better than we do)*. As you can see, you get a pretty faithful duplication of the spreadsheets shown on the screen.

What you do with the data from this point on is completely up to you. We would be interested in learning what you do with this data that we don't do in the PC-Travel for Windows software. If you come up with something you wish were incorporated into the regular software, please let us know.

Study & Run Stats: Tab Delimited Format

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Node	Length	Node Names	Travel	# of	Avg	Total	Time <=	Time <=	Time <=	Fuel	HC	CO	NOx
2	#			Time	Stops	Speed	Delay	0 MPH	10 MPH	30 MPH	(gals)	(gr)	(gr)	(gr)
3	1	0	[Start]											
4	2	800	Mainland	14.3	0	38.1	2.2	0	0	2.2	0.0073	0.6491	8.4385	0.3933
5	3	1648	Guilbeau	40.5	0.5	27.7	15.8	4.3	8	19.8	0.0178	1.7398	17.4961	1.1285
6	4	2597	Bresnahan/Mistic	64.2	0.5	27.6	24.5	10.5	14.3	26.5	0.0469	3.9732	59.8937	2.6248
7	5	2523	Braun	45.7	0.2	37.7	7.3	0.8	1.5	6.5	0.0463	3.8942	66.6312	2.6939
8	6	2392	[End]	36.2	0	45.1	-1	0	0	0	0.0202	1.6078	23.1407	0.9634
9	Total	9960		200.8	1.2	33.8	48.8	15.7	23.8	55	0.1385	11.864	175.6	7.8038

Figure T8.6 — Study Stats in Tab Delimited Format Opened in Excel

	1	2	3	4	5	6	7	8	9
1	Node	Length	Node Names	BANDOUT1	BANDOUT2	BANDOUT3	BANDOUT4	BANDOUT5	BANDOUT6
2	#			03/02/1991	03/02/1991	03/02/1991	03/02/1991	03/02/1991	03/02/1991
3				14:55	15:05	15:13	15:22	15:31	15:40
4				[Before]	[Before]	[Before]	[Before]	[Before]	[Before]
5	Travel Time								
6	1	0	[Start]						
7	2	800	Mainland	12	15	12	20	12	15
8	3	1648	Guilbeau	25	40	48	27	42	61
9	4	2597	Bresnahan/Mistic	118	51	56	43	61	56
10	5	2523	Braun	41	55	42	50	39	47
11	6	2392	[End]	33	39	36	38	34	37
12									
13	Total	9960		229	200	194	178	188	216
14									
15	Number of Stops								
16	1	0	[Start]						
17	2	800	Mainland	0	0	0	0	0	0
18	3	1648	Guilbeau	0	0	1	0	1	1
19	4	2597	Bresnahan/Mistic	2	0	0	0	1	0
20	5	2523	Braun	0	1	0	0	0	0
21	6	2392	[End]	0	0	0	0	0	0
22									
23	Total	9960		2	1	1	0	2	1

Figure T8.7 — Run Stats in Tab Delimited Format Opened in Excel

The two figures shown above show how the study and run stats that were exported in tab delimited text file format look when opened in Excel *(I know, if you are going to use Excel you would probably use the Excel format. However, we don't have another spreadsheet program to use as an example so use your imagination).* You need to clean up the formatting of the cells a bit before they look exactly like this, but presumably you know how to do this *(probably much better than we do).*

You can also use the tab delimited text file format files in other programs, such as database programs or programs that you write yourself in C++ or Visual Basic.

What you do with the data from this point on is completely up to you. We would be interested in learning what you do with this data that we don't do in the PC-Travel for Windows software. If you come up with something you wish were incorporated into the regular software, please let us know.

Tutorial 9

How to Convert PC-Travel for DOS Studies

How to Convert PC-Travel for DOS Studies

PC-Travel for Windows supports studies done with the original DOS version of the program. It is a pretty simple procedure to convert the old files to the new format.

There are three ways to get started:

1 – You can select **Convert PC-Travel for DOS Study** from the ***Startup Options***.

2 – You can select the **Convert** icon from the toolbar in the ***Study Summary*** screen.

3 – You can select **Convert PC-Travel for DOS Study** from the **File** menu in the ***Study Summary*** screen.

If you do one of these, you will see the screen shown below.

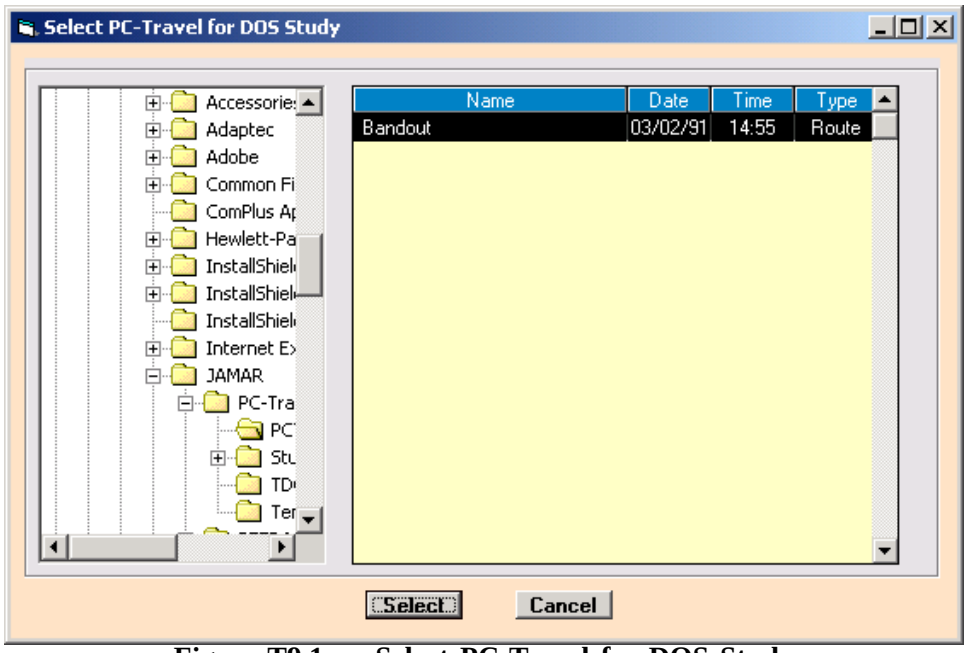


Figure T9.1 — Select PC-Travel for DOS Study

This screen is used to select the PC-Travel for DOS study you wish to convert. The install program created a folder called ***PCT-DOS Data Files*** and loaded a sample set of files. You can simply click on **Select** to choose this study for purposes of this tutorial, or you can navigate through the tree to find the folder on your computer with the study you want to convert.

The list to the right of the tree shows any .trv files in the selected folder, which are the primary study files used in PC-Travel for DOS.

You want to highlight a study and then click **Select**.

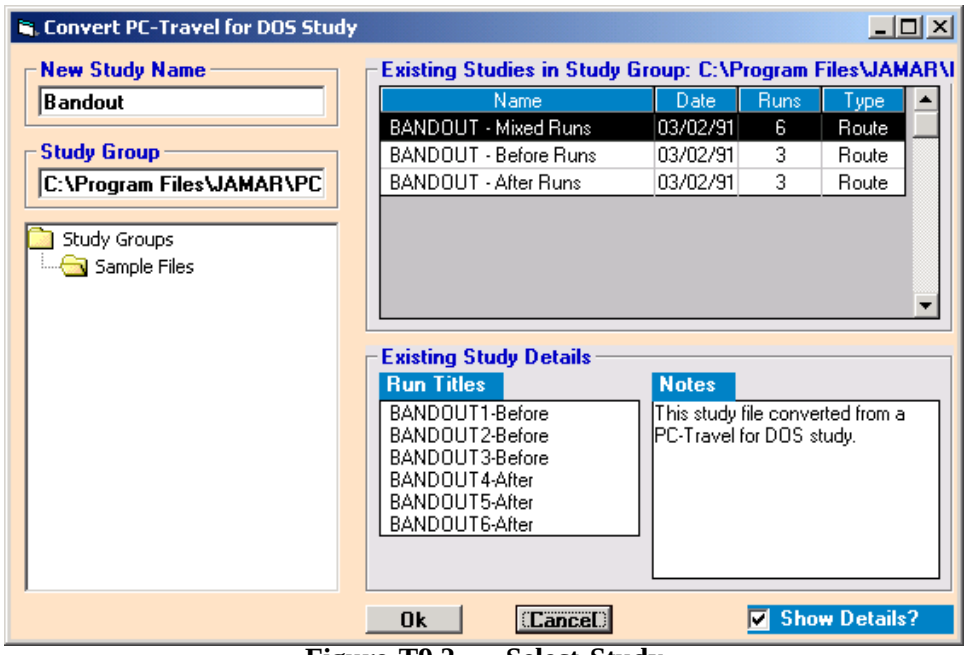


Figure T9.2 — Select Study

This screen is used to give the new study a name and also allow you to pick or create a Study Group where the study will be stored. The default name is the name of the .trv file and the default Study Group is the current Study Group. Neither of these are likely to be good choices for the new study.

You can edit the name in the New Study Name text box to be more descriptive; you aren't limited to 8 characters any more. This means you'll probably want to change the name.

You can select an existing Study Group by clicking on the name in the tree, or you can create a new Study Group by typing the new name into the Study Group text box and pressing enter.

The two other windows on the screen are there to help you pick unique names for the Study and the Study Group. The top window shows a list of all of the studies in the Study Group selected in the tree.

The Existing Study Details frame shows the Run Titles and Notes of the study highlighted in the Existing Studies in Study Group frame.

Note: Neither of these two windows have anything to do with the new study! They are only there to help you avoid choosing a name that already exists.

Click **Ok** after you edit the **New Study Name** and **Study Group** text box. The software then goes through a fairly complicated process to check the PC-Travel for DOS study you selected. It makes sure all of the files needed are present, creates new runs from the old run files, and finally creates a new study file from the old files.

If there is a problem with the conversion you will get an error message, otherwise you are returned to the ***Study Summary*** screen.

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Appendix

Appendix 1 — Descriptions of the Preferences Options

PC-Travel for Windows has many options that you can set or select to help customize the software to your own personal preferences. These options are stored on your computer and loaded into the software each time you run the program. You view or change the options in the Preferences screens.

There are three ways to load the Preferences screens:

1 – You can select **Define/Edit Program Preferences** from the ***Startup Options*** screen.

2 – You can select the **Prefs** icon from the toolbar in the ***Study Summary*** screen.

3 – You can select **Preferences** from the **File** menu in the ***Study Summary*** screen.

If you do one of these, you will see the screen shown below.

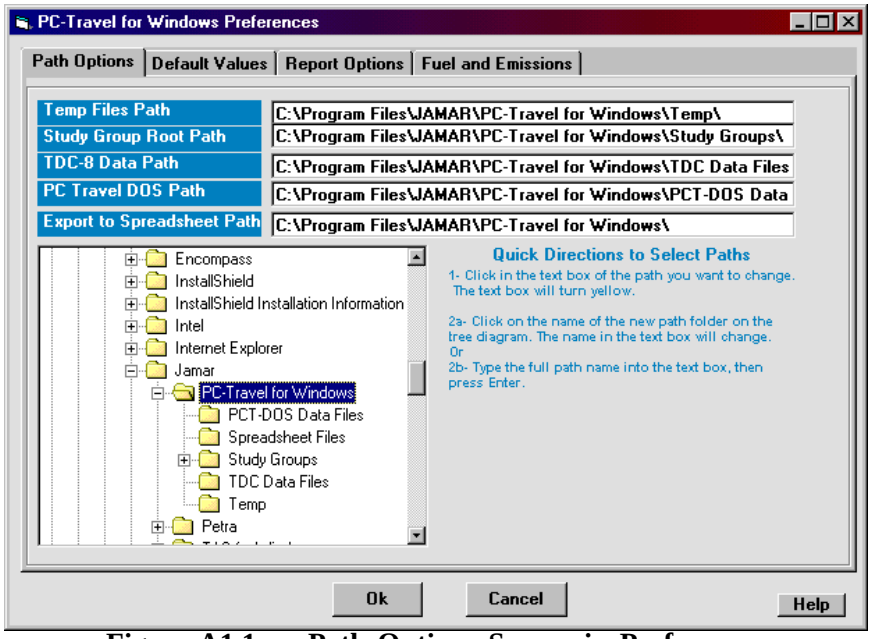

Figure A1.1 — Path Options Screen in Preferences

The figure shown here is the Path Options screen, and is the first of the four screens in the Preferences section. The various screens are selected by clicking on the tabs at the top of the screen. There are four tabs — Path Options, Default Values, Report Options, and Fuel & Emissions Options.

Path Options

PC-Travel for Windows, like most Windows programs, stores data in files, and those files must reside somewhere on your computer in folders. Where those folders are located on your computer is called the *path*, and you can change the paths used in the program to suit your needs.

Note: If you are not comfortable with computer terms such as file, folder, directory, subdirectory & path then this isn't the place to learn it. Either find a good book on Windows (preferably) and learn how files and folders work, or (most likely) just accept the default values the software suggests and don't worry too much about it.

There are five different types of files that are used in PC-Travel for Windows, and each type of file is stored in a separate folder (or set of folders). The five paths are listed at the top of the screen.

Below the paths on the left side of the screen is a tree diagram showing how your folders are organized on your computer. If you are familiar with Windows then you should be familiar with the way this tree works; you can scroll around using the scroll bars and you can expand and contract the tree by clicking on the + and - signs to the left of the folders.

To the right of the tree is some text that gives quick directions on how to set the various paths. The basic idea is simple, you pick the file type for the path you want to change, and then you navigate to the folder you want to use for those files.

Temp Files Path

When you read a TDC-8 counter, the data is first stored in the ***TDC Data Path*** *(see below)*, and then each of the runs in that data is extracted and stored with a temporary name in one folder. These runs are then processed later in the Process Temporary Runs screen. The ***Temp Files Path*** points to this folder.

The install routine creates a folder called Temp as a subdirectory to the PC-Travel for Windows folder, and the ***Temp Files Path*** is initially set to this folder. You probably won't need to change this path, but you can if you find it necessary.

Study Group Root Path

The concept of a Study Group is explained in Chapter 1, but basically a Study Group is a folder where related runs and studies are stored. The ***Study Group Root Path*** points to the parent directory of the many Study Group folders that you create when you do your studies. All Study Groups are subdirectories of this parent directory. Several of the screens in the software show a tree diagram similar to the one in Figure A1.1. The top of the tree is set to the Study Group Root Path folder so that all you can see are your Study Groups and not your entire computer. *(There are also trees like the one in Figure A1.1 where you need to be able to navigate throughout your entire computer. These trees don't have a root path, per se.)*

The install routine creates a folder called Study Groups as a subdirectory to the PC-Travel for Windows folder, and the ***Study Group Root Path*** is initially set to this folder. Unless you do many travel time studies, you probably won't need to change this path, but you can if you find it necessary.

If you do plan to do lots of studies, then you may want to create different Study Group Root folders on your computer *(such as one for each year or one for each customer if you are a consultant)*. Every study you do at a new location usually ends up with two new study groups, one for each direction of travel. It doesn't take long to have dozens of study groups, which could result in a long list of study groups in the tree listings. This is fine as far as the software is concerned, but may be a little awkward to use. We suggest you initially start with the default structure that the install routine creates and see how that works. Once you are comfortable with how the software deals with study groups, files and folders, then you can create a system to handle your studies.

TDC Data Path

When you read a TDC counter, the data is read from the counter and stored in the folder set by the ***TDC Data Path***. You can then clear the TDC counter and use it for other things, even if you don't plan to process the travel time data immediately. At any time you can choose to process the TDC data from the Startup Options screen *(select Process Runs button)* or from the Study Summary screen *(select Process Runs in Temp Folder from the File menu)*. See Tutorial 3 for more details.

The install routine creates a folder called TDC Data Files as a subdirectory to the PC-Travel for Windows folder, and the ***TDC Data Path*** is initially set to this folder. You probably won't need to change this path, but you can if you find it necessary.

PC-Travel DOS Path

If you have used PC-Travel for DOS (the predecessor program to PC-Travel for Windows) to create travel time studies then you can convert those studies into PC-Travel for Windows files very easily. See ***Tutorial 9 — How to Convert PC-Travel for DOS Studies*** for complete details.

The ***PC-Travel DOS Path*** points to the directory where you have your studies stored. The install routine creates a folder called PCT-DOS Data Files under the PC-Travel for Windows folder and puts a set of PC-Travel for DOS sample files in that folder.

If you have PC-Travel for DOS studies on your computer that you might want to convert *(you may do a study on the same route and want to do a before and after analysis)* then you probably would want to change the path to point to the directory where the studies are stored. If you have many different directories with study data, then you should pick a folder that is a parent to those directories so that when you go to the ***Select PC-Travel for DOS Study*** screen, the tree will start at the parent directory and show the directories with the studies under it.

If you don't have PC-Travel for DOS studies to convert, then ignore the setting completely.

Export to Spreadsheet Path

A feature of the PC-Travel for Windows software is the option to export the study and run statistics calculated by the program to file formats that can be processed with other software programs. You can export to a Microsoft Excel spreadsheet file format *(.xls)* or to a generic tab delimited text file *(if you don't know what that is then you probably don't want to do it.)*

The ***Export to Spreadsheet Path*** points to the folder where the exported files are stored. The install routine creates a folder called Spreadsheet Files under the PC-Travel for Windows folder and the ***Export to Spreadsheet Path*** is initially set to this folder.

You may want to change this path if you plan to export files. You may want to have the path set to a folder that is under the software application you want to use to process the exported files. The choice is yours.

Default Values

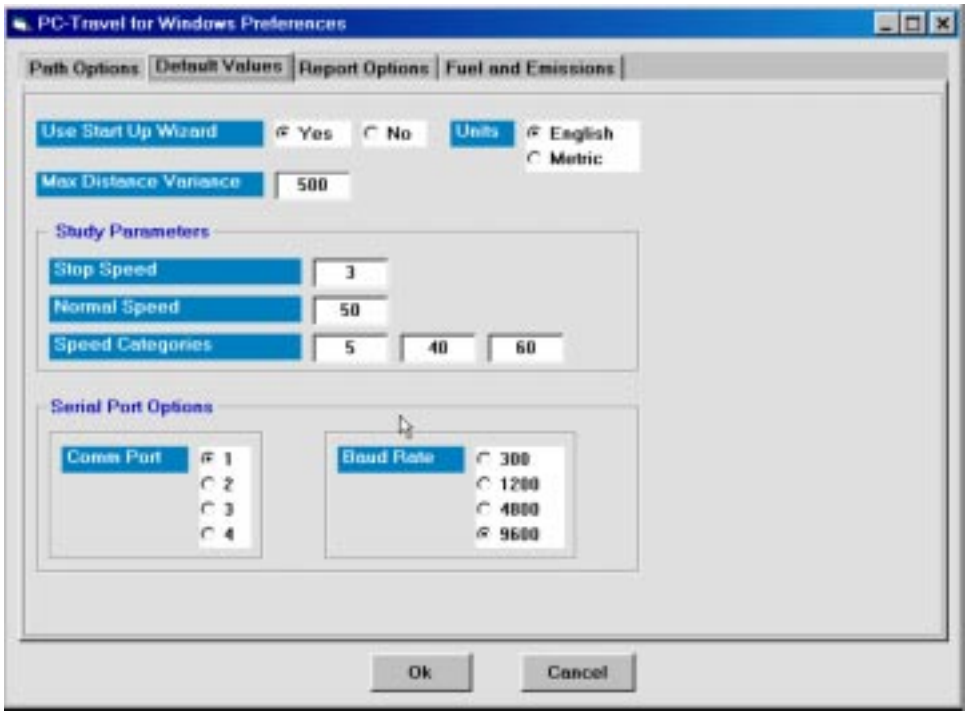

Figure A1.2 — Default Values Screen in Preferences

The figure above shows the Default Values screen, which has a hodgepodge of default options that you can set in the software. Most of these options can be adjusted in other places in the software on a study by study basis; the values on this screen are the default values that are used initially. Many of these options you will set just once and never adjust again.

Use Startup Options Screen

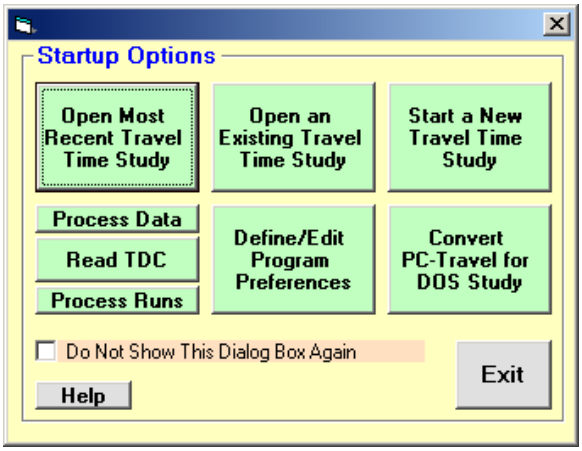

Figure A1.3 — Startup Options

When you first start PC-Travel for Windows, you normally see the screen shown in figure A1.3, which gives you the most common options when you first start the program. Some users don't like this screen, so for them we give them a way to turn it off. Click on the **No** checkbox and you won't be bothered again.

Units

You can choose between English and Metric units for the length and speed values shown on the screen and on the reports. The software checks this setting whenever it has to display or print a length or speed.

English units use feet for distance and Miles Per Hour (MPH) for speed. Metric units use meters for distance and Kilometers Per Hour (KPH) for speed.

Max Distance Variance

Avg	Run 1	Run 2	Run 3	Run 4	Run 5
0	0	0	0	0	0
766	800	771	744	752	736
2354	2051	2420	2409	2453	2392
5463	5045	5077	5049	5086	7488
7928	7568	7505	7543	7522	9917
9934	9960	9972	9949	9885	

Figure A1.4 — Node Distances

This value is used in the Node Distances screen, part of which is shown here, to help determine if the node distances in the runs are good or not. Each run in the study is a column in the right side of the grid. Each node distance found in the run is shown in a separate row in that column. Since all of the runs started in the same place, ended in the same place, and the driver probably tried to mark each node at the same place, the assumption is that there should be the same number of nodes in each run, and the distances for each node should be about the same. Since the TDC-8 doesn't measure distances precisely *(See Appendix 2 — How Distances are Measured)*, the values won't be identical, even if the driver was very good at pressing the New Link button as he drove by the node point, but they will be fairly close.

The software compares each node distance to the average of all of the node distances for that row. If the distance is less than the **Max Distance Variance**, then the distance is shown in green. Otherwise, the distance is shown in red. Values in red alert you to a potential problem. See ***Tutorial 6 — How to Find Node Distances in Your Study*** for a complete discussion of this topic.

The default value is 500 feet, which is good if your nodes are widely spread apart, as they are in most studies. You might want to adjust this value if you like to have many nodes in your studies, and they tend to be closer together. You want the value to be high enough so that if you miss a node in the field the next node in the data (which will show up on the missing node's row) shows up with a red background. However, you don't want the value so low that you get red backgrounds on data that is ok. In general, values as low as 200 feet usually are safe.

Study Parameters: Stop Speed, Normal Speed, and Speed Categories

These parameters are described in Chapter 1. You can set the default values that are shown on the Study Summary screen when you create a new study.

Note: The values are unit-less. That means that if you change the Units from English to Metric, these numbers don't change. A value of 5 for Stop Speed means 5 MPH for English units and 5 KPH for Metric. This normally would never be an issue, since you likely will pick one unit or the other and not switch.

Serial Port Options: Comm Port and Baud Rate

You use the serial port on your computer to read the travel time data collected in the field with your TDC counter. The software needs to know the Comm Port on your computer that is connected to the TDC counter *(always using the JAMAR cable that came with the counter)*. This isn't always easy to determine. If you aren't sure, try Comm 1 and try to read a TDC counter. If that doesn't work, try Comm 2.

The software also needs to know the Baud Rate that is set on the TDC counter. This setting determines the speed at which the data is transferred. The default is 9600 and really there is usually no reason to ever change this.

Report Options

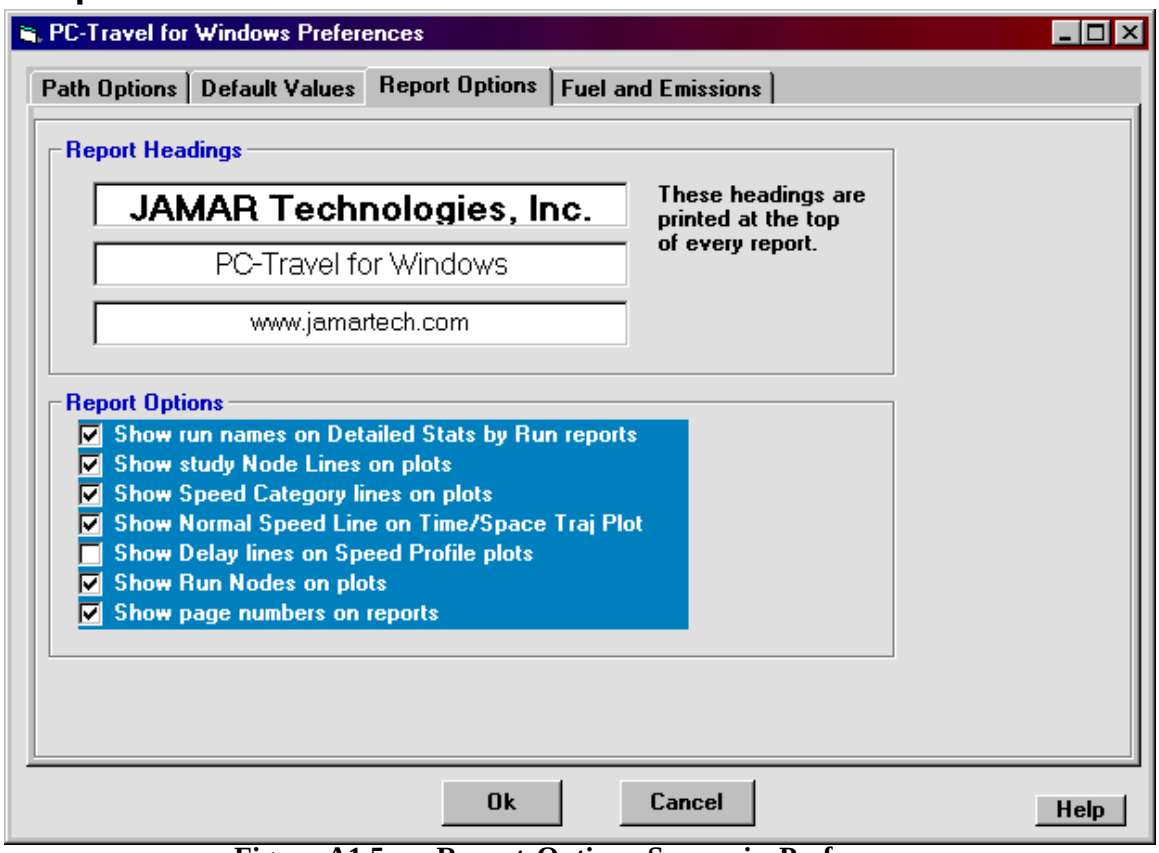

Figure A1.5 — Report Options Screen in Preferences

PC-Travel for Windows has extensive report capabilities since the end result of almost all travel time studies are printed reports showing the results. You can customize the reports to suit your needs. The values on this screen are the default values that are used whenever you go to the Select Reports to Print screen. You can change any of these values on a report-by-report basis by clicking on the Report Options button on that screen.

Report Headings

These headings are printed at the top of every report. There are three headings, but you don't have to use all three. The top line is printed in bold in a larger font size than the other two lines. All three lines are centered on the page. Normally, you set these values once and don't worry about them again. Put the name of your organization or city or whatever on the top line and your address and/or phone number on the next two lines.

Figure A1.6 — Report Headings

If you are a consultant, however, you probably would want to have your customer's name at the top of every report. In that case, you would set the headings when you print the reports, not on this screen. Some consultants use the third line to say ***"Prepared by: Acme Consultants"*** or something similar.

Show Page Numbers on Reports

Figure A1.7 — Report with Page Numbers

You can easily print reports that have thirty or forty or more pages. The software even prints a Table of Contents that reference the page numbers. So normally, you would probably want to show the page numbers on all reports. However, you may print a report for your use, and want to

copy just a few of the pages to send to someone else. Sending reports that say Page 2, and then Page 9, and then Page 22 may look odd. For these occasions, it might be useful to not show the page numbers on the reports. If you do this all of the time, you may want to uncheck this option.

Show Run Names on *Detailed Stats by Run* Reports

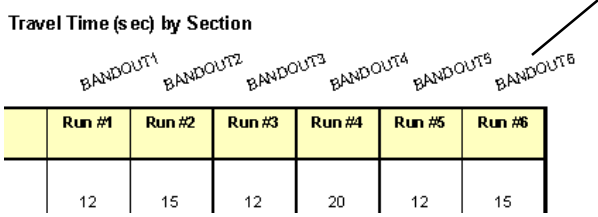

Figure A1.8 — Run Names on Report

Run names can be fairly long, but the space available for the run names on the reports is limited. To solve this, the software prints the run names at an angle above the run columns. On most printers this looks fine, but on some older dot-matix printers the names come up very ragged. If you have an older printer, or if you just don't like the way the run names look, then you can turn this option off and the names won't be printed.

Show Study Node Lines on Plots & Show Speed Category Lines on Plots

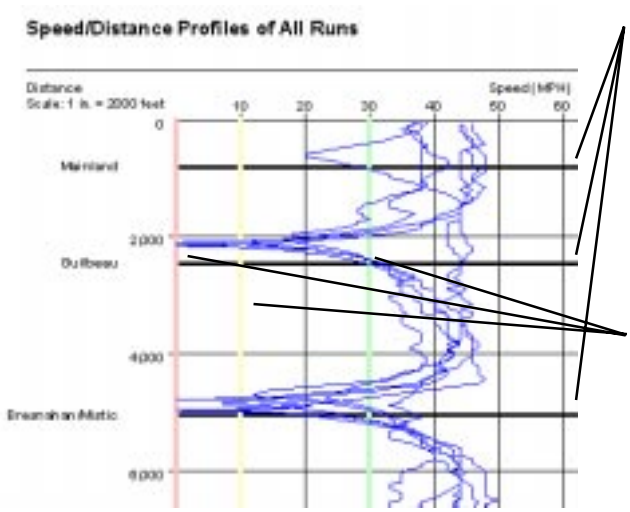

Figure A1.9 — Node Lines and Speed Category Lines on Plot

Node Lines: Nodes are shown on the plots as thick black lines, with the name of the node shown on the left side of the graph. You may have several nodes close to each other so that the graph looks cramped. This is unusual, but it can happen. The plot might look better without the node lines and names shown on the plot. Whatever the reason, if you don't want them on the plot, then you can turn off this option.

Speed Categories: You can set three speed categories and the software will find the time driving at or below these speeds for each node during a run. The speed categories are shown as three lines on the plots, a red line for Speed Category 1, a yellow line for Speed Category 2, and a green line for Speed Category 3. Whatever the reason, if you don't want them on the plot, then you can turn off this option.

Show Normal Speed Line on *Time/Space Trajectory* Plots

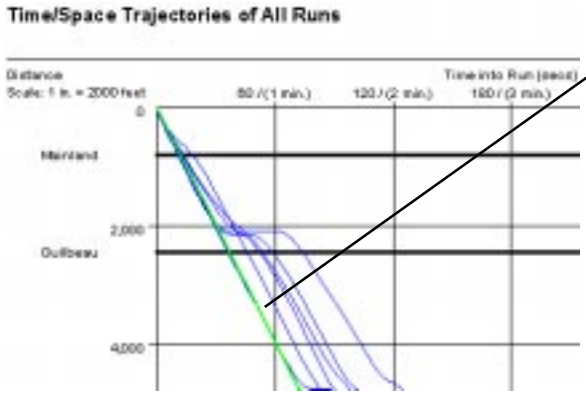

Figure A1.10 — Normal Speed Line on Time/Space Trajectory Plot

The Normal Speed is a parameter used to find Total Delay. It typically is the posted speed limit or the design speed for an arterial. The Normal Speed is shown as a thick green line on the Time/Space Trajectory plot, which is useful to show the progression of traffic through the signals on the arterial. There may be instances where the Normal Speed isn't appropriate on this plot, or the thick line might obscure the details of the smaller lines behind it *(especially on a black and white printer)*. If you don't like this option, you can turn it off.

Show Delay Lines on Speed Profile Plots & Show Run Nodes on Plots

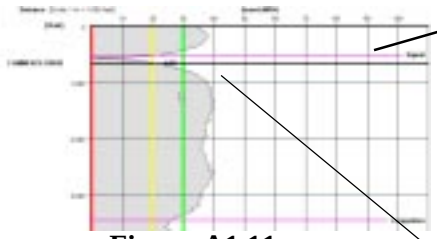

Figure A1.11 — Show Delay Lines on Plot

Delay Lines: You have the option to mark reasons for delay when you do a travel time study. You do this by pressing different buttons on the TDC-8 as you do each run. *(This is explained in Tutorial 2: How to Do a Fixed Route Travel Time Study).* You can have the graphs show where the delay buttons were pressed *(the pink line)* along with the meaning of the button *(the text at the end of the pink line)*.

Run Nodes: The Node Lines shown on the plot are for the entire study, and usually are the average of all of the node distances for the runs in the study. You can have the graphs show where the node button was pressed for this run. The software prints a small solid circle and the text "NL" at the proper distance. This should always be right next to the node line. Sometimes the average distance used for the study appears to put the node a couple of hundred feet away from where the actual node for that run occurred, which may be on the wrong side of the intersection. Showing the Run Nodes may help explain why the delay appeared to occur after the intersection instead of before it.

Fuel and Emissions

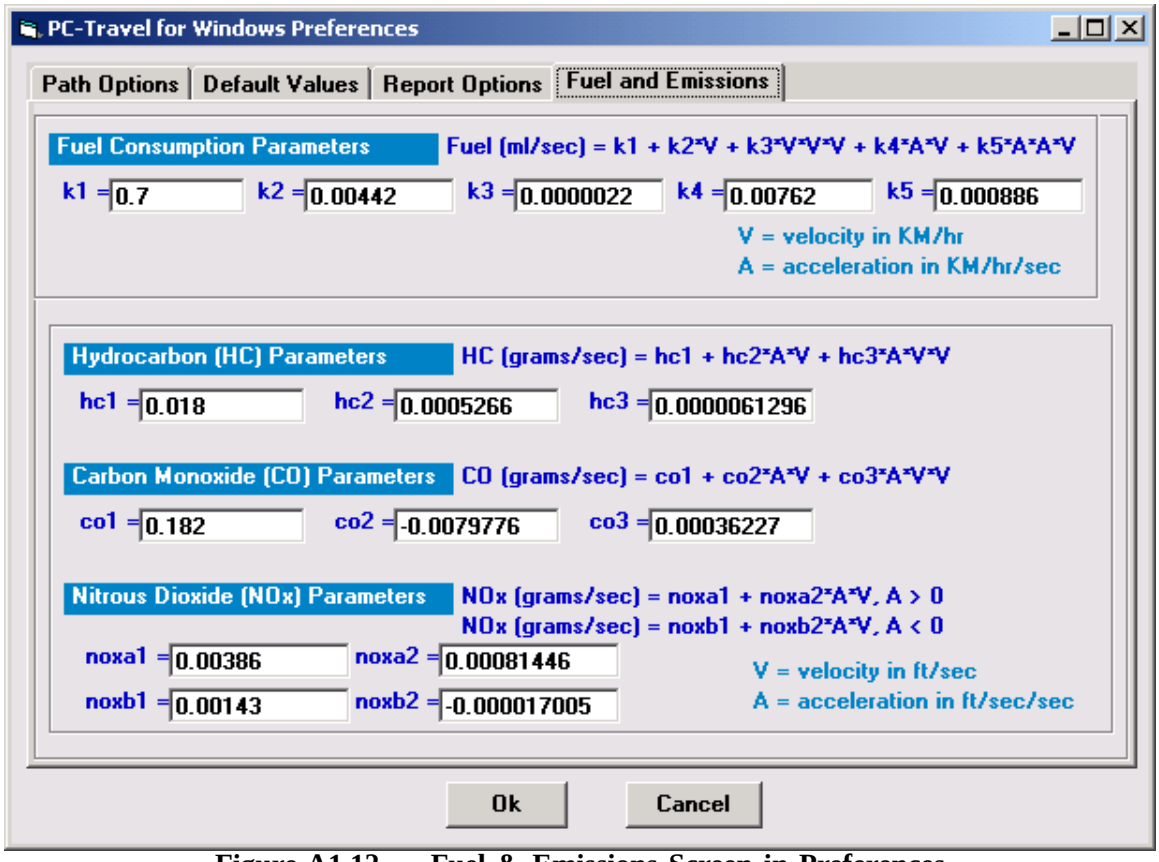

Figure A1.12 — Fuel & Emissions Screen in Preferences

PC-Travel for Windows can calculate fuel and emission statistics using fairly simple models developed over ten years ago. These models use formulas that have a variety of constants, shown in the figure above.

The default values are shown in the white text boxes. You can edit any of these values if you so desire.

Unless you understand exactly what you are doing, we suggest you leave them alone.

Appendix 2 — How Distances are Measured

PC-Travel for Windows is a travel time and delay analysis program and is not intended to be used as a distance measuring instrument like the RAC (Road Analysis Computer) distance measuring devices that JAMAR sells. However, distance traveled is a component of travel time, and understanding the way distances are measured and calculated may help you to understand the results of your travel time analyses.

Data is collected in the TDC-8 by counting the number of pulses coming from the transmission sensor and storing the count on a second by second basis. Each pulse from the sensor represents a constant distance traveled by the vehicle. The software converts the number of pulses to distance using the Calibration Constant that you found when you calibrated your vehicle. Therefore, the TDC-8 measures the distance traveled every second, which is the speed of the vehicle. We say the data collected by the TDC-8 is the *instantaneous speed* of the vehicle on a second by second basis.

When you push one of the buttons on the TDC-8, either the New Link button or one of the delay buttons, the TDC-8 adds a marker to the data for the second in which you pushed the button. All the analysis software can tell from the data stored in the TDC-8 is that you pushed the button sometime during a particular second. Also, only one button push can be stored in any given second. If you push a button twice in the same second, the second button is stored in the next second *(you almost never do this in travel time studies)*.

It is important to remember that you are using this program to measure travel times and delays, and that as long as the distance measurements are accurate enough to accurately report speed and travel time and also are accurate enough for traffic operations purposes, then everything is ok. If you really want to be able to measure distances very accurately, then you should use a true distance measuring instrument like a JAMAR RAC-200. However, that won't give you the history of speeds and stops, which is the reason for PC-Travel for Windows.

The way the data is collected has some subtle implications, especially in the way that distances are measured:

Distance measurement is not continuous, it jumps in second by second increments. The faster you are going the larger the jumps from second to second. If you are traveling at 60 MPH *(88 ft/sec)* then each data point is 88 feet from the last data point.

Any button pushes can only be measured to the nearest second in time, and to the distance traveled in that second. If you are traveling at 60 MPH and push the New Link button, the software only knows the distance to within 88 feet *(the distance at the beginning of the second in which the button was pushed to the distance at the end of the second).*

The total length of the route you travel is measured accurately. If you start a run going 30 MPH *(by pressing the DO button)* and end a run going 30 MPH *(by again pressing the DO button)* then the total error in the route distance will be 2 X 44 feet *(the error in the starting second and the error in the ending second)*, plus the error in the transmission sensor *(which is about 1 foot per mile),* or less than 100 feet even if the entire route is 5 miles or more long. This is more than adequate for travel time and delay studies.

The Node Distance errors are proportional to the speed of the vehicle when the New Link buttons are pressed. Again, if the vehicle is going 60 MPH as it passes through several nodes, then each time you press the New Link button, the software will only be able to calculate the distance to within 88 feet, even if you precisely press the button at the same place during each run.

It is this last implication that is the most noticeable in PC-Travel for Windows. It is the reason that the ***View Node Distances*** screen *(part of which is shown in figure A2.1)* is designed the way it is. Assuming you press the New Link button for each node on every run, you will have several measurements for each node distance, one for each run. The software finds the average of the individual node distances and makes that distance the node distance which is used in the rest of the program. The assumption is that the average of the individual node distances should be more accurate than any one set of distances from just one run. Averaging will help correct for the error associated with the way the data is stored in the TDC-8, as well as the error associated with trying to push the New Link button at exactly the same place each run while you are driving.

Avg	Run 1	Run 2	Run 3	Run 4	Run 5
0	0	0	0	0	0
766	800	771	744	752	736
2354	2051	2420	2409	2453	2392
5463	5045	5077	5049	5086	7488
7928	7568	7505	7543	7522	9917
9934	9960	9972	9949	9885	

Figure A2.1 — Node Distances

Normally, the error in the node distance measurements is small enough to ignore, especially if you do collect node distance information for each run. The only time when the distances may not be completely adequate is when two nodes *(signals, typically)* are very close together on a high-speed arterial. Say, for example, that the speed on a street is 40 MPH *(about 60 ft/sec)* and two signals are only 200 feet apart. The software may inaccurately report the distance between these two signals by as much as 60 feet, though it will accurately report the travel time between them. Again, the inaccuracy will not affect operational analysis, but you may not like the look of it. In this case you can manually edit one of the distances on the Node Distances screen so that the distance between the two signals is what you and others who know the road would expect to see.

If it is important that the Node Distances are very accurate, you have at least two choices *(we don't recommend either of these since normally the distances are fine, but we like to be thorough)*:

1 – **Use a true distance measuring instrument like the JAMAR RAC to measure the distances accurately**. This involves driving the route with the RAC connected to the transmission sensor either before or after you collect the travel time data. Then manually enter the distances into the ***Node Distances*** screen. There is no need to collect any node information during the travel time runs if you find the distances with a RAC.

2 – **Use the TDC-8 to measure the distances accurately** by driving the route and slowing the vehicle down as slow as possible *(to a stop is best)* before pressing the New Link button. Since the error in the distance measurement is proportional to the speed of the vehicle when you press the button, slowing to a low speed will make the measurement more accurate. Of course, this may not be possible or practical to do; you can't always slow down at will. However, it is an option if you don't have a RAC distance measuring instrument and want very accurate node distance information *(Hey, just go out at 4 in the morning. The traffic is light and you get too much sleep anyway).* Don't use this run in your travel time study, since it doesn't represent true driving behavior. Just use it to find the distances and then manually enter the distances into the Node Distances screen. As with the DMI option there is no need to collect any node information during the travel time runs if you find the distances with a separate run.

Warning: Avoid the temptation to use your GIS database *(if you have one)* to measure the distances between nodes. GIS maps don't usually accurately represent the up and down motion of the vehicle as it drives up and down little hills or grades on your route. The result is that the distances you get from your GIS measurements are usually shorter than the distances measured with the transmission sensor in your vehicle. The nodes won't be where they should be on your plots and the node-to-node statistics won't be correct.

Appendix 3 — Utilities

This appendix describes three utilities included with PC-Travel for Windows to help you organize your data. The first lets you edit runs on your computer whether they are included in studies or not. The second lets you delete temporary runs that may accumulate in your Temp folder. The third lets you delete TDC data files that you read from your TDC hand held counters and no longer need after you have processed the data into runs.

Select Run and Edit Run Details

When you read a TDC counter with travel time data the software creates temporary runs from the data. These temporary runs are then renamed and moved to their own Study Groups in the ***Process Runs in Temp Folder*** screen. The runs contain most of the information needed by the software to process the run data into study statistics, but not all. For example, the date and time of the run is already known, but the node names are not. At some point you need to edit the information in each run. There are two ways you can do this.

One way is to create a study with the new runs and then edit each run in the study to complete the information. The sequence would be as follows:

1 – Read the TDC and process the runs. You'll end up with the runs from the data in their own Study Groups.
2 – Create a new study *(Click on the icon labeled **New** on the toolbar)*
3 – Add the runs for that study. *(Click on Add Run(s) button and select the runs for that study)*
4 – Show the Run Details screen for each run in the study. *(Click on the Run Title and then click **Show Details**)*
5 – Edit the run as needed and then save it. Do this for each run in the study.
6 – Process the study as usual.

This is the sequence you normally would follow if you process your runs and create and print your studies all at the same time.

Alternatively, you can edit the run information without creating any studies. Then when you create the studies you won't have to deal with the runs; you'll know they are already complete. The sequence for this method would be:

1 – Read the TDC and process the runs. You'll end up with the runs from the data in their own Study Groups.
2 – Show the Run Details screen for each run. *(Click on the **Edit Run** toolbar and select the run)*
3 – Edit the run as needed and then save it. Do this for each run you processed from the TDC data.
At some later date:
4 – Create a new study. *(Click on the icon labeled **New** on the toolbar)*
5 – Add the runs for that study. *(Click on Add Run(s) button and select the runs for that study)*
6 – Process the study as usual.

With this sequence, you completely take care of all of the runs after you read them from the TDC before you worry about putting them into studies. This is a good sequence to follow if you don't necessarily create and print your studies immediately after you read the data from the TDC.

Which of these two sequences you use is completely up to you.

How to Select a Run to Edit

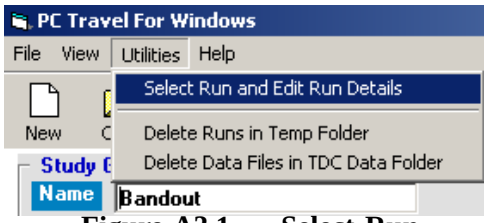

Figure A3.1 — Select Run

You can edit any run on your computer at any time. From the main screen *(it doesn't matter what study is currently visible)*, click on ***Select Run and Edit Run Details*** from the **Utilities** menu, as shown in the figure here. This will bring up the screen shown in Figure A3.2.

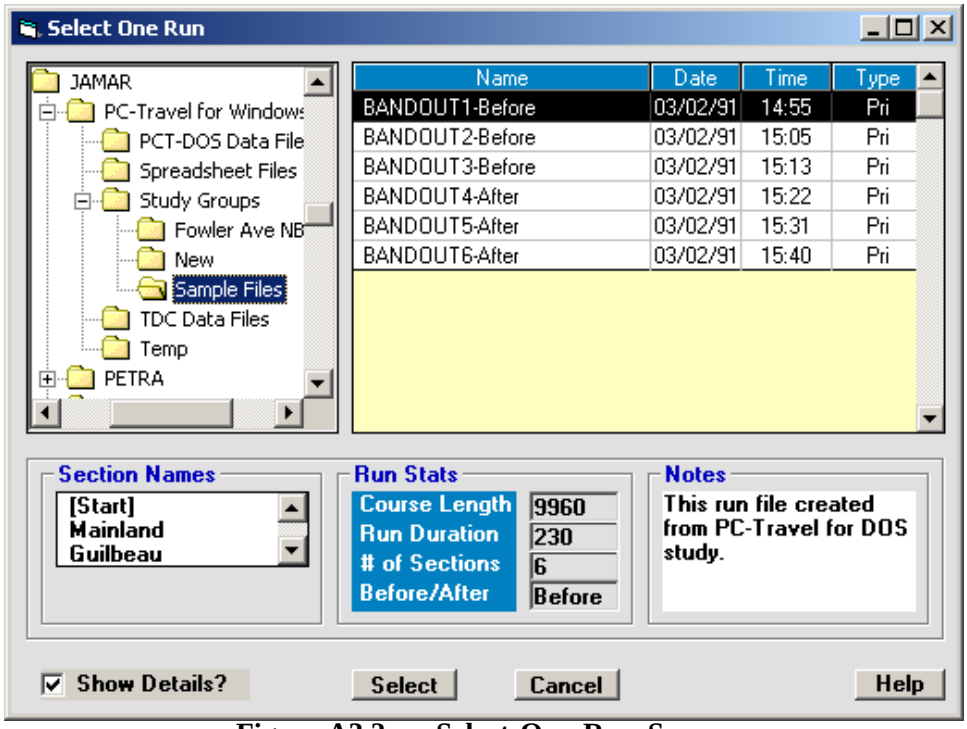

Figure A3.2 — Select One Run Screen

This screen has three main sections. The upper left shows the familiar tree structure, with the current Study Group highlighted. You can navigate to other Study Groups if necessary. The upper right shows the runs in the highlighted Study Group, along with the Date, Time, and Type of run *(Primary or Secondary)*. The lower portion of the screen shows details of the run that is highlighted in the upper right window.

Navigate, if needed, to the Study Group that has the run you want to edit. Click on the run in the upper right window. Check the details and make sure it is the run you want, then click **Select**. You can click **Cancel** to exit at any time. When you click **Select**, the ***Run Details*** screen for that run is displayed.

The ***Run Details*** screen shows just about everything we know about this particular run. This screen is described on pages T1.7 and T1.8 of this manual so that information won't be repeated here.

You want to edit the information on this screen so that all of the information shown is correct. Normally, this just requires you to edit the node names *(this is described in detail in **Tutorial 5 — How to Edit Nodes in Individual Runs**)* and possibly enter some notes from your field notes. You can check the data by looking at the Stats and the Plot to see if there are any obvious problems. You may occasionally need to edit the sensor data to get rid of little problems you find *(this is described in **Tutorial 7 — How to Edit Sensor Data**)*.

Remember to edit all of the runs you created from the TDC data. Normally, the runs are in two separate Study Groups for each route, one for each direction. Don't forget to do the runs in the second direction after you finish with the runs in the first.

Delete Runs From Temp Folder

When you read a TDC counter with travel time data the software creates temporary runs from the data, which are stored in the Temp folder that has been set in the Preferences screen. These temporary runs are then normally renamed and moved to their own Study Groups in the ***Process Runs in Temp Folder*** screen, which empties the Temp folder. Occasionally, however, runs may accumulate in the Temp Folder for a variety of reasons. You may have some bad runs that you don't want to use in studies. You can delete these one at a time in the ***Process Runs in Temp Folder*** screen, but you may forget. Or, you may read a TDC count board twice for some reason and create duplicate runs that you have already processed. Whatever the reason, if you find your Temp folder has files you don't want then there is an easy way to get rid of them.

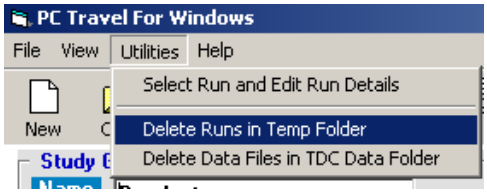

Figure A3.3 — Delete Runs in Temp

From the main screen, select **Delete Runs in Temp Folder** from the **Utilities** menu, as shown here. This will bring up the ***Select Temp Runs to Delete*** screen shown in Figure A3.4.

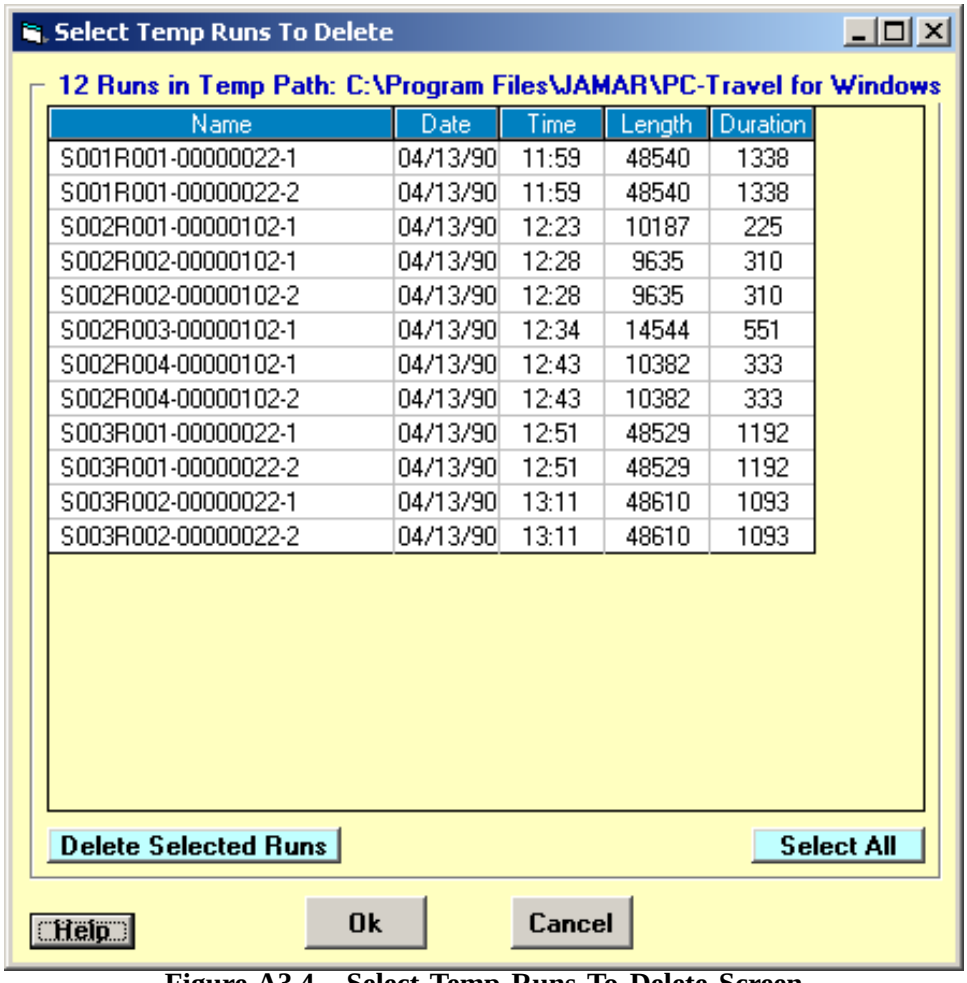

Figure A3.4 - Select Temp Runs To Delete Screen

This screen shows a list of runs in your Temp folder. The number of runs and the path to the Temp folder are shown at the top of the screen. The Name, Date, Time, Length, and Duration of each run are shown on each line in the list. If you click on a line then that line is highlighted. If you click on the line again, the highlight disappears.

Below the list are two buttons, one labeled **Delete Selected Runs**, the other **Select All**.

Click on each run you want to delete to highlight that run. If you want to select all of the runs, then click on **Select All**. You can click on any selected run to un-select it. When all of the runs you want to delete are highlighted, click on **Delete Selected Runs**. Those runs disappear from the list.

The runs aren't actually deleted from your computer yet. That doesn't happen until you click the **Ok** button. If you select one or more runs by accident and click the **Delete Selected Runs** button *(so they are no longer listed on the screen)*, you can just click on **Cancel** to return to the main screen without deleting any runs. Then you can return to this screen and select the runs you meant to select the first time.

Continue to select runs to delete and click the **Delete Selected Runs** button. When all of the runs you want to delete are gone, click on the **Ok** button. The runs are permanently deleted from your computer.

You may never need to use this utility, but it is there if you do.

Delete TDC Data Files From TDC Folder

When you read a TDC counter the software first creates a copy of the data from your TDC counter and then stores that data in your TDC Data folder in a file. The path to this folder is set in your Preferences settings. The file is automatically given a name based on the current date and the number of times you read a TDC counter that day. For example, if you read a TDC counter on Dec 4, 2000 then the file would be given the name **!PC-Travel-12-04-00-1.tdc**. If you read another TDC counter that day, the second file would be **!PC-Travel-12-04-2.tdc** (*the ! is a convention some people use for temporary files*).

The .tdc file is immediately and automatically processed into runs which are stored in your Temp folder, without you ever interacting with them at all.

Normally, you don't ever need to think about these files. The files are not automatically deleted, however, so over time you may accumulate a number of these files on your computer. They don't do any harm, but after you have processed the data, they don't do any good either. If you want to, they are easy to delete.

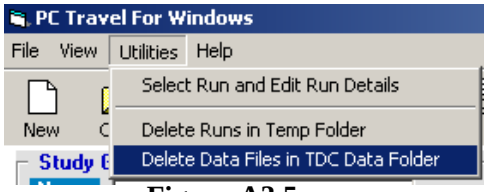

Figure A3.5 — Delete TDC Data Folder Files

From the main screen, select **Delete Data Files in TDC Data Folder** from the **Utilities** menu, as shown here. This will bring up the ***Select TDC Data Files to Delete*** screen shown in Figure A3.6.

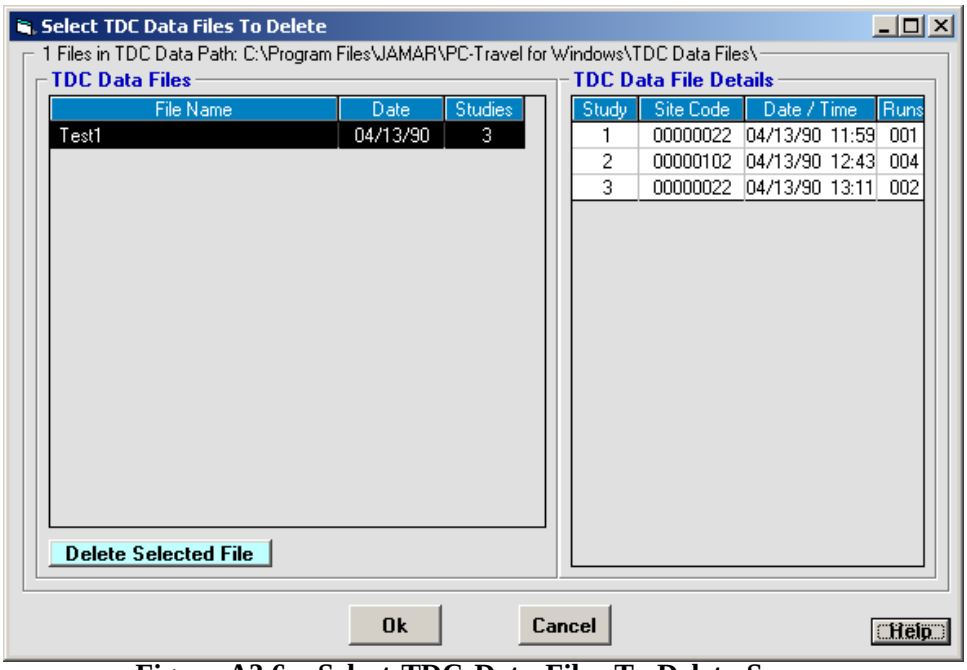

Figure A3.6 - Select TDC Data Files To Delete Screen

There are two main sections to this screen. The left side, labeled **TDC Data Files**, shows a list of the data files in the TDC Data File folder. The list shows the name of the file, the date the file was created *(not when the data was collected)*, and the number of studies in the data.

The right side, labeled **TDC Data File Details**, shows details of the studies found in the highlighted data file, including the Site Code entered in the TDC counter when the study was done, the date and time of the first run in the study, and the number of runs in that study. The intent is to give you enough information about the data so that you can make an educated decision about deleting that file.

Click on a data file in the ***TDC Data Files*** window. Check the ***TDC Data File Details*** window. If you want to delete this file, click on the **Delete Selected File** button. The file disappears from the list.

The file isn't actually deleted from your computer yet. That doesn't happen until you click the **Ok** button. If you select one or more files by accident and click the **Delete Selected Files** button *(so they are no longer listed on the screen)*, you can just click on **Cancel** to return to the main screen without deleting any files. Then you can return to this screen and select the data files you meant to select the first time.

Continue to select a data file to delete and click the **Delete Selected File** button. When all of the files you want to delete are gone, click on the **Ok** button. The files are permanently deleted from your computer.

Why Doesn't the Software Automatically Delete the TDC Data Files?

As explained above, you normally never see the TDC data file. The software creates the file when you read the TDC counter and then immediately processes the data into temporary run files, which is where you first see the data from the TDC counter. In theory, we could delete the data file as soon as it is processed into temporary runs.

We don't do that in case there is some sort of problem with processing the runs. You may run into a problem that requires us to send you updated software. If you have the TDC data file, you don't need to have the TDC counter available. Or we may ask you to send us the TDC data file so we can see what problems you are having. This probably won't be necessary, but just in case, we don't delete the file — you do, and only when you are sure you'll never need that data again.

Appendix 4 — Notes on Fuel and Emissions

The Fuel and Emission statistics in PC-Travel for Windows uses the same microscopic simulation models as in PC-Travel for DOS. This was done for two reasons. First, it allows continuity between the two programs. If you are comparing data from studies done with the two programs the calculations will compare easily. Second, it was easy to do since all of the information needed to do the code was available.

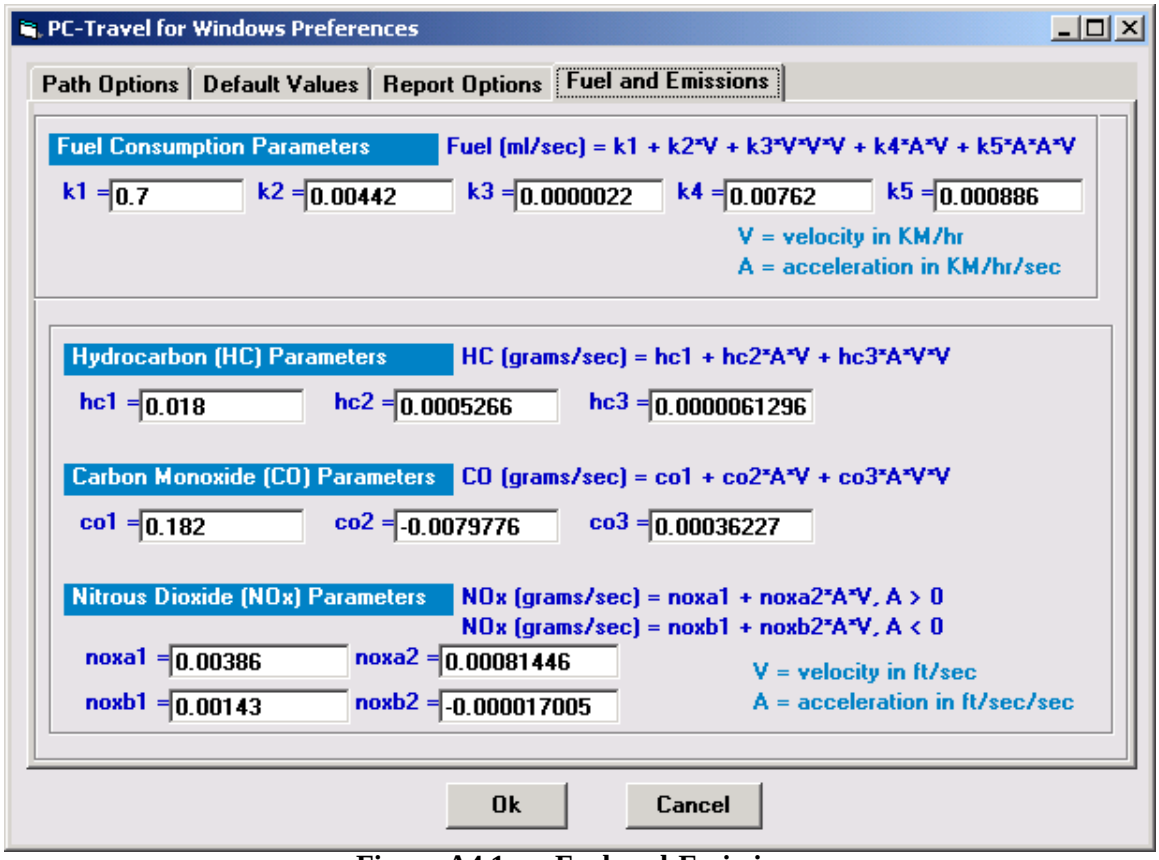

Figure A4.1 — Fuel and Emissions

This is the Preference screen showing the Fuel and Emissions constants. The values shown are the default values used in PC-Travel for DOS. You can edit them if you want to and know what you are doing. I'd leave them alone unless you are sure.

The Fuel and Emissions statistics show up in a variety of places in the program.

1 – Run Stats You can see the Fuel and Emissions calculations for any single run.

2 – Study Stats You can see the Fuel and Emissions calculations for the entire study.

3 – Reports You can print summary reports or individual run reports showing total Fuel and Emissions.

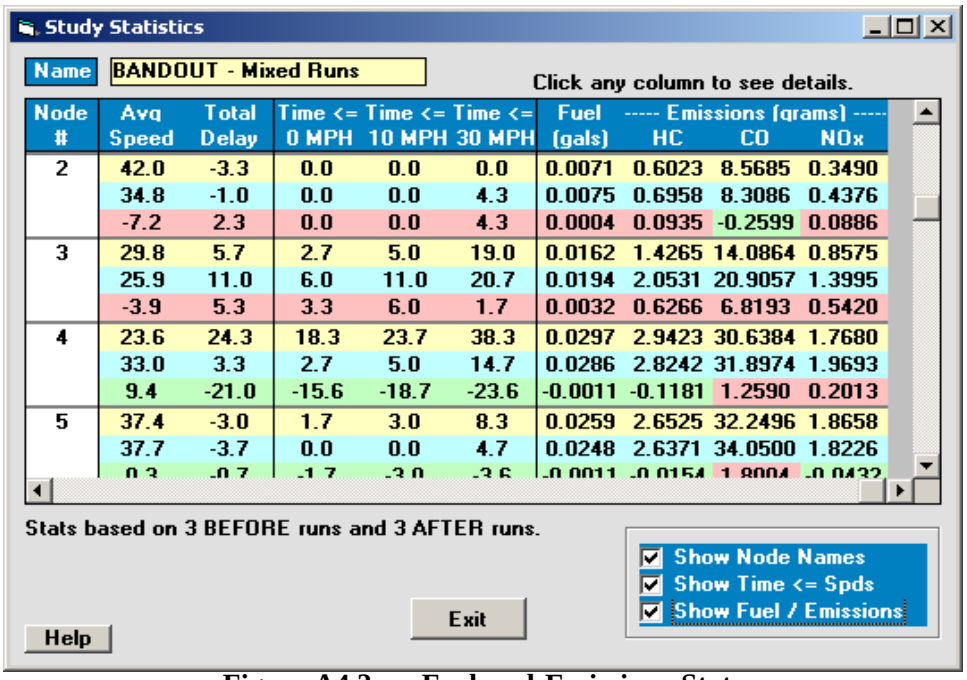

Figure A4.2 — Fuel and Emissions Stats

This screen shows what the Fuel and Emissions statistics look like on the ***Study Stats*** screen. Select the **Stats** icon from the toolbar to see this screen.

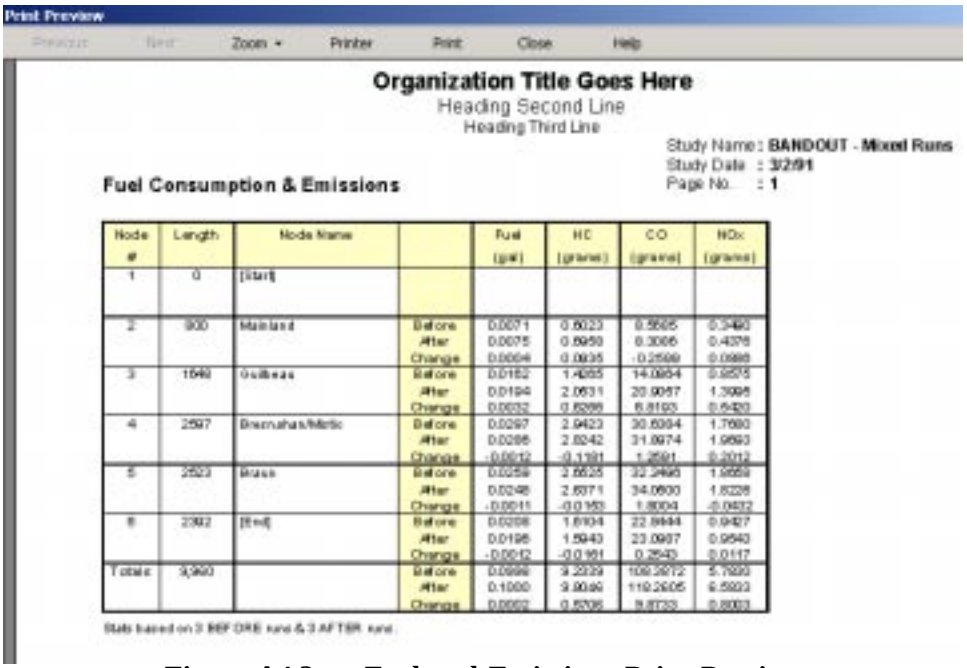

Figure A4.3 — Fuel and Emissions Print Preview

This screen shows the Print Preview of the ***Fuel and Emissions Summary*** report.

If you have ideas on other ways to present this type of data, or if you have information about these or other models you would like to see a part of the program, then please let us know.

Appendix 5 — Field Worksheet

Fill out the top section and the Node info before you start the runs. Use one sheet for each count.

You could put a rough sketch of the route on the back of the worksheet, especially to show temporary things like work zones.

Reverse the numbering to remind you of the order of nodes in the opposite direction. The numbers match the numbers shown on the TDC-8 during the run.

Mark the End and Start Nodes to remind you to press the DO key at these nodes.

Put the direction and starting time at the beginning of each run.

Add any comments at the end of each run.

PC-Travel Field Worksheet

Location: Bandout Date: 5/11/2000

Site Code: 12345678 Cal Constant: 882

Nodes:

	Start/End	Druid Hills			
1	4	Mainland	16		
2	3	Guilbeau	17		
3	2	Bresnahan/Mistic	18		
4	1	Braun	19		
	e S	Tighe	20		
6			21		
7			22		
8			23		
9			24		
10			25		
11			26		
12			27		
13			28		
14			29		
15			30		

Runs:

#	Dir	Time	Comments	#	Dir	Time	Comments
1	nb	14:55	ok	2	sb	15:03	ok
3	nb	15:15	missed link at braun	4	sb	15:22	ok
5	nb	15:33	ok	6	sb	15:41	ok
7	nb	15:52	slow truck caused backup	8	sb	16:12	ok
9	nb	16:21	ok	10	sb	16:29	late link at guilbeau?
11	nb	16:40	ok	12	sb	16:48	ok
13				14			
15				16			
17				18			
19				20			

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Remember: The point of the worksheet is to record what happens during the runs so the information can be entered properly and easily into the software back in the office. Also focus on items that might effect the interpretation of the data---odd traffic patterns, weather considerations, accidents, work zones, etc. Ask yourself, "What do I want to remember about these runs 6 months from now?"

PC-Travel Field Worksheet

Location: _____ Date: _____

Site Code: _____ Cal Constant: _____

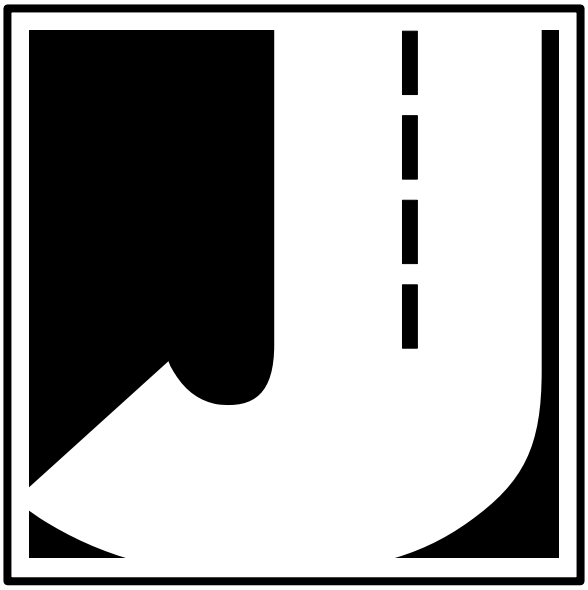
Nodes:

Start/End _____

1 ___		16 ___	
2 ___		17 ___	
3 ___		18 ___	
4 ___		19 ___	
5 ___		20 ___	
6 ___		21 ___	
7 ___		22 ___	
8 ___		23 ___	
9 ___		24 ___	
10 __		25 ___	
11 ___		26 ___	
12 ___		27 ___	
13 ___		28 ___	
14 ___		29 ___	
15 ___		30 ___	

Runs:

#__Dir__Time_____Comments		#__Dir__Time_____Comments	
1		2	
3		4	
5		6	
7		8	
9		10	
11		12	
13		14	
15		16	
17		18	
19		20	



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