Non-Discretionary Plant Additions
Account 367 (Mains) > $100K[1]

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
List No.	Year	Location	Pre- Construction Estimated Cost - Mains[2]	Actual Cost - Mains[3]	Amount the Estimate Varied from Actual Cost (+/(-))	Percentage of Actual Cost Over or Under (-) in relation to Estimate (%)	Total[4] Cost – Mains	Project ID
1	2004	Taunton/ Short Street	$141,825	$121,839	($19,986)	-14%	$145,196	B04D5072
2	2004	Attleboro / County Street	$74,588	$212,140	$137,552	See Justification	$242,403	B04D5071
Justification for Cost Variance - List Nos. 2, 3: MAIN REPLACEMENT. As a permit condition, the Town of Attleboro mandated that all excavated soils had to be removed and be replaced with clean sand and gravel. Extra work required by municipal permit requirements involved backfilling to specific specifications and applying an asphalt cover; later the Town required that patch be removed and filled with concrete. This unanticipated work increased the time, man-hours and police traffic details necessary to complete the project.								
3	2004	Attleboro / Thatcher Ave.	$56,112	$106,001	$49,889	See Justification	132,103	B04D5068
Justification for Cost Variance - List Nos. 2, 3: MAIN REPLACEMENT. As a permit condition, the Town of Attleboro mandated that all excavated soils had to be removed and be replaced with clean sand and gravel. Extra work required by municipal permit requirements involved backfilling to specific specifications and applying an asphalt cover; later the Town required that patch be removed and filled with concrete. This unanticipated work increased the time, man-hours and police traffic details necessary to complete the project.								
4	2004	Franklin / West Central St.	$130,957	$133,668	$2,711	2%	$157,442	B04D5054
5	2004	Stoughton / Brock Street	$35,372	$110,610	$75,238	See Justification	$129,203	B04D5018
Justification for Cost Variance– List No. 5: BARE STEEL MAIN. Planned replacement of 675 feet of 6" bare steel main with 6" plastic pipe. The bare steel pipe, once exposed, clearly was more deteriorated than had been estimated. Placement of increased feet of badly deteriorated pipe increased the scope of the initial project on materials by 50%. In addition, the Town of Stoughton mandated the presence of two police officers on traffic detail during elongated construction. Ledge was encountered during the project, slowing the rate of construction and adding to excavation costs. In addition to the difficulty in digging the pipe trench, the excavated ledge fragments had to be hauled away for disposal. Clean sand and gravel replaced for backfill material								
6	2003	Easthampton West Street	$77,426	$121,891	$44,465	See Justification	$142,572	S03D1082
Justification for Cost Variance– List No. 6: BARE STEEL MAIN. Although originally planned to include 3300 feet of replacement, the project replaced 3925 feet of 4' diameter bare steel pipe in poor condition with a mix of 2" and 4" plastic main. Limits of construction expanded because pipe exposed was in bad condition. Work continued until there was a connection to good main. The new main connected to a new regulator station. The location of the regulator station was moved in the permitting process, adding to the length of pipe required. Added labor costs were incurred to monitor leaks on the existing main during replacement construction.								
7	2003	W. Springfield / West Side Uprate	$219,557	$437,968	$218,411	See Justification	$475,089	S03D1053

1 Justifications provided for variances over 10%.
2 Estimated Cost – Mains is Direct Main Cost only.
3 Actual Cost – Mains is Direct Main Cost only
4 Total Cost - Mains is Actual Indirect and Direct Main Costs for the Project.

Non-Discretionary Plant Additions
Account 367 (Mains) > $100K[1]

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Justification for Cost Variance - List No. 7: BARE STEEL MAIN. Project replaced 1940 feet of 6" diameter bare steel main with 8" diameter coated steel pipe (to increase distribution capacity). An additional 1395 feet of new main was also installed, allowing the system maximum allowable operating pressure to increase from 60 pounds per square inch (psi) to 99 psi.. Early snow and inclement weather delayed the project in 2003. By the time conditions allowed continuation, West Springfield had imposed street opening moratorium, that required closing up for winter and re-mobilizing the project in the spring. New requirements were imposed by the City Council for more extensive street resurfacing along River Street and the Memorial Avenue crossing. The City Council also changed the previously agreed-upon location of a pressure reducing station, adding to material and labor costs.								
8	**2003**	**Northampton / Leeds Uprate**	$106,129	$224,572	$118,443	See Justification	$242,161	S03D1016
Justification for Cost Variance - List No.8: BARE STEEL MAIN. Project to replace over 5,280 feet of badly deteriorating 2" bare steel main with 2" plastic pipe. Closing up the worksite at the end of 2003 construction and re-mobilizing in 2004 added costs. Town of Northampton imposed changes in street restoration requirements after construction began, requiring overlay on large sections of roadway rather than, as estimated, overlay limited to trench width. In addition, unanticipated quantities of ledge and large boulders were extracted, and clean sand and gravel had to be used as backfill and ground support.								
9	**2003**	**Lawrence / Broadway St.**	$117,029	$251,159	$134,130	See Justification	$306,163	L03D0014
Justification for Cost Variance– List No. 9: MAIN REPLACEMENT. Post-estimate project scope was extended to include the City of Lawrence intersection of Water Street and Canal Street. Due to the time of year the decision to extend was made and the location, extra costs were incurred to maintain system integrity. Frost set in earlier than expected and elongated work time. Work site had to be secured for winter and then reopened and completed in spring and summer of 2004.								
10	**2003**	**Sharon / S. Main St.**	$118,492	$175,410	$56,918	See Justification	$198,073	B03D5071
Justification for Cost Variance– List No. 10: BARE STEEL MAIN. Project estimated in concert with Commonwealth's plans to undertake street reconstruction along two miles of South Main Street in Sharon. In the first phase of the construction, 2,500 feet of deteriorating 3" bare steel main was replaced with new 8" plastic pipe. Sharon then unexpectedly specified construction start times of post-9 a.m. and end times of 4:00 p.m. ease rush hour traffic congestion. The unexpected shorter workday elongated the project (more man-days required). Four police details were maintained to control road traffic and ensure site worker safety.								
11	**2003**	**Taunton / Somerset Ave.**	$150,935	$376,714	$225,779	See Justification	$422,786	B03D5041
Justification for Cost Variance– List No. 11: CAST IRON MAIN. In conjunction with a planned municipal street opening in Taunton (replacing 7000 feet of water main under Somerset Ave and surrounding streets), this project replaced cast iron pipe that would have been disturbed by the City's water main replacement project Original estimates showed a need for 3300 feet of new plastic mai to replace old cast iron main. Engineering estimates and distribution system planning called for converting the low pressure main in this area to a 99 pound per square inch (psi) maximum allowable operating pressure (MAOP), improving gas supply pressure and volumes. The existing cast iron did not perform as expected during trench excavation and as the water main was replaced; leaks developed and were managed; the project was expanded into two adjoining streets (Orchard St., Charles St.), increasing the total length of new plastic main installed to 4350 feet. In addition, the City required two police details, instead of the estimated single detail. High traffic volume and delays in the City's construction timetable required the installation of smooth patch installation (with infrared). Unexpected overlay of reinforced concrete (8" thick) had to be opened; concealed, buried and abandoned hundred-year old trolley tracks and ties had to be excavated, sized for transfer, trucked and disposed of.								
12	**2002**	**Ludlow / Inter wk 20" MMWEC**	$60,000	$156,946	$96,946	See Justification	$175,855	223670-2001

Non-Discretionary Plant Additions
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Justification for Cost Variance– List No. 12: INTERCONNECT. The connecting supply point pipeline was of an insufficient depth at the proposed interconnect. Additional excavations, fittings and complex tap configurations were required. Additionally, in an unanticipated post-estimate revision, the Town of Ludlow required design modifications for the interconnect. 24/7 police details at the site during construction was required to thwart vandals at the site.								
13	2002	Springfield / Main St.	$36,076	$194,660	$158,584	See Justification	$244,057	S02D1018
Justification for Cost Variance– List No. 13: CAST IRON MAIN. Coordinated with planned construction of a regulator station, this project was estimated on initial plan to replace a badly deteriorated section of 10" cast iron main with 10" plastic pipe. Based on distribution gas flow then expected from the new regulator, pipe size increased to 12". After exposing the pipe, more pipe than estimated was badly deteriorated. More pipe was replaced than estimated and more tieins required. Main Street in Springfield is highly traveled Route 116. Initial post-estimate permitting included higher cost activities of saw cutting the street, excavating and removing all excavated soils and backfilling using flowable fill. Finally early snow in fall/winter 2003 caused early site closure, additional contractor crew time and materials charges and restart costs in the spring.								
14	2002	W. Springfield / Memorial Ave	$87,916	$152,809	$64,893	See Justification	$178,309	S02D1008
Justification for Cost Variance– List No. 14: CAST IRON MAIN. In conjunction with municipality's stated intent to conduct major street reconstruction, the estimate was to replace confirmed 3600 feet of main. Estimate of contractor services was too low. In addition, concealed and buried railroad ties had to be extracted completely (required larger trench to be excavated), cut for disposal and transported away. Un expected re-routing of pipe required because of competing subsurface utilities (telephone). Re-routing increased man-hours, equipment usage and police presence to control traffic and ensure worker safety.								
15	2002	North Andover / Johnson St.	$78,779	$103,892	$25,113	See Justification	$106,787	L2002D0046
Justification for Cost Variance– List No. 15: BARE STEEL MAIN. Replacement of 1400 feet of bare steel pipe in Johnson St. was estimated, but more was deteriorated, extending the project an additional 300 feet in order to tie-in.								
16	2002	Sharon / Canton St.	$65,146	$103,608	$38,462	See Justification	$119,592	B02D5022
Justification for Cost Variance– List No. 16: CONNECTING COATED STEEL. Following construction of a new gate station in Sharon, the project called for 900 feet of 12" coated steel to connect to an existing 12" main. The estimate was based on the most recent bids for installing 8" main, with allowance for construction with use of a larger diameter pipe. However, open bids exceeded the estimate. There were unexpected costs in managing time and materials in installing the 12" main and coordinating the same with the on-going gate station construction. Final construction costs additional an unexpected 134 feet of main tolink to an interstate pipeline meter and regulator station owned jointly by Algonquin and Duke.								
17	2002	Holbrook / Union St.	$176,257	$188,535	$12,278	7%	$229,452	B02D5015
18	2002	Norton / Freeman St.	$174,770	$150,573	($24,197)	(14%)	$163,215	B02D5012
19	2001	Chicopee / Broadway St.	$59,194	$104,408	$45,214	See Justification	$128,989	S01D1030
Justification for Cost Variance– List No. 19: CAST IRON MAIN. In conjunction with an announced full depth street reconstruction by the municipality of Chicopee on Broadway St., the estimate for the project included costs associated with replacement of 2000 feet of deteriorating cast iron main. Initial estimate assumed project coordination would eliminate costs associated with breaking and restoring pavement. When the municipality unexpectedly delayed its planned construction, Bay State had to excavate the existing road surface, reduce and remove move an 8' thick layer of reinforced concrete, and saw cut for the entire 2000 foot project length. Bay State then was required to excavate and dispose of the surface and subsurface waste; such costs were not contained in the initial estimate.								

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20	2001	W. Springfield / Memorial Ave	$235,856	$277,447	$41,591	See Justification	$313,532	S01D1025
Justification for Cost Variance– List No. 20: BARE STEEL AND CAST IRON MAIN. The project replaced 6" diameter cast iron and bare steel lines with 8" high density plastic pipe, reflecting the needs of distribution planning criteria. Re-routing was necessary due to conflicts with subterranean utilities (telephone) in Memorial Ave. and Windsor St. Additional, unexpected costs were incurred to place sand padding around the new main in critical locations and to construct offsets around facilities of competing utilities.								
21	2001	Chicopee / Chicopee St.	$266,377	$326,913	$60,536	See Justification	$388,472	S01D1019
Justification for Cost Variance– List No. 21: BARE STEEL AND CAST IRON MAIN. Coordinated with a major municipal project announced by Chicopee to install new water and sewer lines, this project was identified for work primarily on Chicopee Street and encompassed a second separate authorization with the same code for side-streets off Chicopee St. Costs incurred under both authorizations were combined in the cost record for S01 D1019.								
22	2001	Lawrence/Broadway St.	$370,760	$533,173	$162,413	See Justification	$592,454	L2001D0001
Justification for Cost Variance– List No. 22: BARE STEEL AND CAST IRON MAIN. In conjunction with full depth street reconstruction of Broadway St. (Route 28) announced by the City of Lawrence, the project anticipated replacement of 3000 feet of 6" cast iron main and 1000 feet of 12" bare steel main. Because the street reconstruction exposed and disturbed main locations in excess of that anticipated, project installation included 4212 feet of new plastic pipe (30% over estimate), mostly replacing aging cast iron.								
23	2001	Foxboro / Baker St.	$90,205	$107,993	$17,788	See Justification	$117,558	B01D5038
Justification for Cost Variance– List No. 23: BARE STEEL MAIN. The project was estimated to replace over 2700 feet of bare steel main. Town permitting unexpectedly required saw cutting and extra time and materials to reduce airborne particles and migration of byproducts caused by saw cutting. Unanticipated quantities of boulder and ledge impeded excavation, increased cost of removal and disposal, and required expenditure and transport of clean sand and gravel for use as backfill and compacting material.								
24	2001	Marshfield / Ferry St.	$107,367	$103,147	($4,220)	-4%	$119,055	B01D5010
25	2001	Canton / High St.	$95,938	$133,617	$37,679	See Justification	$153,567	B01D5008
Justification for Cost Variance– List No. 25: BARE STEEL MAIN. In concert with municipal street reconstruction in High Street, the project was estimated to replace a deteriorating bare steel main. Crews unexpectedly encountered large rock and ledge in order to excavate the trench for new main, requiring large equipment and blasting, which took specialized labor, additional police details, coordination with municipal authorities, and increased trucking, disposal and clean fill costs.								
26	2000	Northampton / Ryan Rd.	$105,900	$169,402	$63,502	See Justification	$195,487	S00D1043
Justification for Cost Variance– List No. 26: BARE STEEL MAIN. Project estimated at replacement of 5300 feet of bare steel main coordinated with full depth municipal street reconstruction by Northampton. Once exposed, the pipe condition warranted replacement of an additional 763 feet to tie in new pipe. Unexpectedly, Northampton required Bay State to foot cost of surface paving. Heavier than anticipated traffic volume required additional police. Final main cost includes 12 un- or under-estimated tie ins on side streets (51% of the variance).								
27	2000	W. Springfield / Riverdale St. (Rte 5)	$46,259	$112,477	$66,218	See Justification	$117,141	S00D1001

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Justification for Cost Variance– List No. 27: MAIN REPLACEMENT/RELIABILITY IMPROVEMENT. Riverdale St. at the construction area is busy Route 5, a four-lane state highway. The initial project estimate was based on engineering for street's edge, off pavement construction. The permit, however, required breakdown lane installation, resulting in higher costs for pavement removal, controlled density fill material and police details. The use of controlled density backfill material meant that no excavated soil could be reused in the trench, adding to removal and disposal charges. Finally, the new main was expected to cross Route 5 using an abandoned gas main a sleeve for plastic pipe insertion. Once exposed, it was determined by engineering that the abandoned line was unusable. Therefore, the actual crossing beneath Route 5 imposed significantly more complex construction (including boring technology) and related cost.								
28	**2000**	**Andover / Phillips St.**	$127,676	$120,992	($6,684)	-5%	$130,025	L2000D0012
29	**2000**	**Lawrence / Exeter St.**	$109,967	$106,187	($3,780)	-3%	$110,397	L2000D0005
30	**2000**	**Hanson / Brook St. 12"**	$169,306	$222,288	$52,982	See Justification	$236,773	B00D5029
Justification for Cost Variance– List No. 30: BARE STEEL MAIN/RELIABILITY IMPROVEMENT. This project was undertaken in three phases to improve gas pressure and delivery. As estimated in this phase, 3870 feet of 12" coated steel replaced an equivalent length of 8" bare steel main installed in 1952. Extra pavement cuts, asphalt removal and resurfacing costs were incurred to comply with Hanson's unplanned decision to widen the street. Additional police details were required to secure worker safety and control traffic.								
31	**2000**	**Taunton / Floral St.**	$117,923	$101,794	($16,129)	-14%	$115,500	B00D5020
32	**1999**	**Easthampton / Plain St.**	$61,190	$132,280	$71,090	See Justification	$136,967	S99D1053
Justification for Cost Variance– List No. 32: BARE STEEL MAIN. The project was estimated for replacement of 4400 feet of deteriorating bare steel main, but once exposed, the extent of deterioration was greater than expected. In total, 5348 feet of new main was installed (22% more than estimated). Easthampton permitted the construction on the condition that the replacement main be installed under pavement, rather than beneath the concrete sidewalk, as previously estimated. In addition, Bay State had to compensate for the replacement of drainage pipes, the installation an asphalt berm along 400 feet of the road's edge and install a 400 foot asphalt patch.								
33	**1999**	**South Hadley / Falls Project**	$131,005	$161,191	$30,186	See Justification	$172,085	S99D1014
Justification for Cost Variance– List No. 33: MAINS REPLACMENT. This project was designed to work in cooperation with the continued 1998 Falls Project, a state funded storm water separation project. After the estimate, it was determined that some main segments had to be installed at greater depths because of conflicts with other utilities' underground facilities, but that work was impeded and complicated by high groundwater levels. Groundwater had to be contained (to prevent trench collapse) by continuous pumping. Finally, the road sub-base was predominantly clay, an inappropriate compacting material. To protect its main, Bay State had to remove, dispose of, and refill the trench, protecting its main, with sand fill and processed gravel. Because of all these factors the construction pace slowed, requiring longer police details for traffic control and worker safety.								
34	**1999**	**South Hadley / Granby Rd.**	$98,845	$180,372	$81,527	See Justification	$201,320	S99D1011
Justification for Cost Variance– List No. 34: BARE STEEL MAIN. The project was estimated based on expectation of replacing 3000 feet of bare steel main (circa 1925). South Hadley subsequently conditioned its permit approval on the installation of a sidewalk along Granby Road (1500 feet). Additionally, when the main was exposed for ties on neighboring streets Hillcrest Rd. and Malcolm Ave, the bare steel in those locations could not support the tie in because of its own evidence of deterioration. An additional, unexpected 400 feet of new main was installed and additional costs incurred to re-route and resolve underground conflicts with other utilities (telephone, water).								

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35	1999	North Andover / Mass. Ave.	$114,518	$138,112	$23,594	See Justification	$152,179	L99D0074
Justification for Cost Variance– List No. 35: CAST IRON MAIN. Undertaken with a planned municipal sewer improvement project in North Andover, this project estimated the replacement of 2300 feet of 6" cast iron main (circa 1907). As construction commenced, it was clear that the replacement main conflicted with the Town's intended sewer construction, resulting in re-routing with an increased total of 2659 feet of 6" pipe being installed to eliminate the conflict. In addition, the project continued throughout the winter, incurring higher seasonal costs associated with winter construction efforts.								
36	1999	Lawrence / Thissel St.	$54,781	$145,875	$91,094	See Justification	$150,073	L99D0032
Justification for Cost Variance– List No. 36: SYSTEM DELIVERABILITY/RELIABILITY. This system improvement project was engineered to improve gas from the Oak Street gate station. Once construction commenced, it was discovered that the main in Oak St. (also known as Route 110) was entrenched deeper than expected: to permit work in and around the main, a shoring box was constructed to protect against soil cave-ins. There was an increased amount of excavated material. Police details to control traffic and ensure worker safety exceeded estimates. Finally, mid construction and unrelated to it, Lawrence suffered a sewer pipe collapse beneath Thissel Street, which further delayed Bay State's ability to complete its construction.								
37	1999	Attleboro / Pine St.	$168,062	$323,149	$155,087	See Justification	$343,206	B99D5058
Justification for Cost Variance– List No. 37: BARE STEEL MAIN. The project planned to replace 8" bare steel (circa 1916) in downtown area of Attleboro. Initial contractor bids came in much higher than expected. Construction was further impeded by concealed and unmarked drains, none of which were revealed on City maps, that were struck by contracting equipment and then required welding repair on site. In addition, each offset required extra fittings. While construction crews were staged, welded repaired drains required x-ray confirmation before construction for main replacement could proceed.								
38	1999	Taunton / Dexter Ave.	$296,081	$273,558	($22,523)	-8%	$299,252	B99D5056
39	1999	Walpole / Elm St. 8"	$218,409	$252,606	$34,197	See Justification	$272,868	B99D5040
Justification for Cost Variance– List No. 39: BARE STEEL MAIN. In conjunction with Walpole's planned water main replacement on Elm St. (Route 27) and then street reconstruction, project estimated replacing over 5,200 feet of deteriorating bare steel main. Based on system design recommendations, a 8" coated steel main was installed to replace the existing bare steel main. A Walpole permit condition required a payment to the town in lieu of paving, not anticipated in the project estimate. In addition, Walpole's unexpected permit conditions required that trench backfill be tested for compaction at least twice within every 100 feet, trenches had to be paved after 95% compaction was achieved, and no trench was to be left unpaved at the end of each workday, meaning temporary paving was required each night of active construction.								
40	1999	Avon / W. Main St.	$69,360	$162,378	$93,018	See Justification	$184,231	B99D5033
Justification for Cost Variance– List No. 40: BARE STEEL MAIN. Planned full-depth road reconstruction on W. Main St., an Avon thoroughfare, was estimated to coordinate with replacement of deteriorating bare steel in the area. During construction, the amount of new 4" plastic pipe installed was increased by 40%, from 2060 feet to 2886 feet, in order to connect to existing main in good condition. Attempts at coordination with Avon municipal officials and expected road reconstruction caused the project to start and stop repeatedly, mobilizing and demobilizing the contractor crew. 2886 feet of main was installed in W. Main St., in two sections. Earlier estimated costs anticipated some construction off pavement, but the Avon Water Department usurped, requiring the new gas main to be placed beneath the paved roadway entirely, in order to reserve the easier-access, unpaved location for the municipal water line.								
41	1999	Seekonk / Fall River Ave.	$163,399	$181,207	$17,808	See Justification	$204,218	B99D5032

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Justification for Cost Variance– List No. 41: BARE STEEL MAIN. Estimated n conjunction with municipal full depth street reconstruction of Fall River Ave in Seekonk, state highway Route 6, to replace over 5200 feet of deteriorating bare steel with coated steel. The estimate underestimated the difficulty and expense of excavating the concrete street. Seekonk permit conditions required flowable fill, that added to fill and disposal costs.								
42	1999	**Attleboro / Knight Ave. 12"**	$428,000	$983,168	$555,168	See Justification	$1,137,791	B99D05029
Justification for Cost Variance– List No. 42: BARE STEEL AND WROUGHT IRON MAIN. Project to replace 4000 feet of bare steel and wrought iron main (c. 1928) with 7000 feet of 12" cathodically-protected coated steel. Project included a railroad crossing, which required mains to be laid below it and the competing sewer and water utilities; therefore the required trench was significantly deeper (at 8-12 feet) than anticipated. Increased depth of construction resulted in sheeting and shoring costs, higher excavation costs, additional spoil removal costs. In addition, thicker-than-expected pavement was present for over 1000 feet in South Main Street (Route 152); breaking pavement and disposal of spoils was higher than the estimate. Permitting unexpectedly eliminated the expectation of the initial estimate to site the main beneath sidewalk. Finally, permitting conditions unexpectedly prohibited abandoning 755 feet of wrought iron in place (as normally allowed). Additional costs were incurred for removal, sizing for transport and disposal of wrought iron main.								
43	1999	**Seekonk / Newman Ave.**	$81,158	$126,146	$44,988	See Justification	$135,068	B99D5020
Justification for Cost Variance– List No. 43: BARE STEEL MAIN. In conjunction with municipal full depth street reconstruction of Newman Avenue (Route 152), .estimate did not include construction costs in light of concealed underground box culvert deep below Newman Ave. and Brook St. Additional costs were incurred to work around the culvert. In addition, the main was more badly deteriorated than expected, requiring removal and replacement of increased footage (from 1880 feet to 2282 feet) in order to connect to existing main in good condition.								
44	1999	**Hanson / Oldham St.**	$258,603	$559,583	$300,980	See Justification	$635,034	B99D5019
Justification for Cost Variance– List No. 44: BARE STEEL MAIN/ SYSTEM RELIABILITY. 8" diameter bare steel main (c. 1952) replaced with coated steel pipe meeting system design requirements. More welding was required than estimated intially: the route presented a number of unanticipated below ground obstructions such as drain, sewer or water lines. In addition, he Town of Hanson undertook simultaneously to widen Brook St., resulting in extra pavement cuts, removal of spoils and unwanted fill, and increased resurfacing, unplanned paving for 1900 feet of road surface, and cold planning for 1065 square yards. Police safety details were required over a larger area to secure worker safety and allow traffic movement.								
45	1999	**Chicopee / Grattan St.**	$162,345	$166,197	$3,852	2%	$190,955	S98D1041
46	1999	**South Hadley / Falls Project**	$154,670	$210,225	$55,555	See Justification	$232,347	S98D1040
Justification for Cost Variance– List No. 46: MAINS REPLACMENT. This project was designed to work in cooperation with the continued 1998 Falls Project, a state funded storm water separation project. After the estimate, it was determined that some main segments had to be installed at greater depths because of conflicts with other utilities' underground facilities, but that work was impeded and complicated by high groundwater levels. Groundwater had to be contained (to prevent trench collapse) by continuous pumping. Finally, the road sub-base was predominantly clay, an inappropriate compacting material. To protect its main, Bay State had to remove, dispose of clay spoils, and refill the trench, protecting its main with sand fill and processed gravel. Because of all these factors the construction pace slowed, requiring longer police details for traffic control and worker safety. Additionally, the project was estimated at 8850 feet; 9725 feet of main was installed. Lastly, during construction in 1999, construction crews uncovered an historic cistern. Construction was halted; and billable downtime occurred while South Hadley's Historic Commission inspected and documented the artifact.								
47	1998	**Northampton / West St.**	$117,985	$322,102	$204,117	See Justification	$350,865	S98D1010

Non-Discretionary Plant Additions
Account 367 (Mains) > $100K[1]

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
List No.	Year	Location	Pre- Construction Estimated Cost - Mains[2]	Actual Cost - Mains[3]	Amount the Estimate Varied from Actual Cost (+/(-))	Percentage of Actual Cost Over or Under (-) in relation to Estimate (%)	Total[4] Cost – Mains	Project ID
Justification for Cost Variance– List No. 47: CAST IRON MAIN. Original estimate was based on project, planned in conjunction with municipal full depth street reconstruction of West St. (state highway Rte. 66), to replace more than 5200 feet of cast iron main (c. 1908 - 1927). Unanticipated delays occurred in the state highway project. In the middle of the multi-year project, and following the initial authorization, Bay State was notified that a bridge over the Mill River, maintained for the purpose of utility crossings, was expected to be abandoned: on that bridge was Bay State's 8" intermediate pressure main feed into Northampton center. Additional engineering analysis demonstrated that it would be reasonable to install an 8" coated steel line in West St as part of this highway reconstruction to provide an alternate feed into downtown Northampton in light of the bridge's expected demolition. In total, 4786 feet of 8" coated steel and 2709 feet of 2" plastic main were installed (instead of the 2300 feet of 6" and 5600 feet of 2" plastic as originally estimated). Finally, the highway construction lowered the road elevation and grade of Paquette St., leaving a Bay State main with insufficient cover. Bay State was required to lower the main at unexpected expense to conform to regulations.								
48	1998	**Chicopee / Granby Rd.**	$233,120	$282,512	$49,392	See Justification	$315,613	S98D1007
Justification for Cost Variance– List No. 48: BARE STEEL MAIN. Because the project was estimated to take place in conjunction with planned municipal full depth street reconstruction in Granby Rd., it was estimated without resurfacing costs; however, Chicopee delayed its work, requiring Bay State to repave the surface for traffic and main safety. In addition, unexpected work on four side streets to replace deteriorating main discovered post-estimate added 1004 feet of 2" main. Offsetting higher cost was the reduced main cost on Granby St. proper, where only 10,000 feet of new main was required (11000 feet had been estimated).								
49	1998	**Lawrence / Ferry St.**	$76,637	$110,642	$34,005	See Justification	$115,166	L98D0068
Justification for Cost Variance– List No. 49: CAST IRON MAIN. Planned to coordinate with City of Lawrence repair on Ferry St., project to replace 1548 feet of deteriorating cast iron main (c. 1905). After exposing the main, more pipe than expected was in poor condition. 1860 feet of deteriorated cast iron main was ultimately replaced.								
50	1998	**Methuen / Pleasant St.**	$59,772	$147,296	$87,524	See Justification	$154,013	L98D0023
Justification for Cost Variance– List No. 50: CAST IRON MAIN. Project to replace a cast iron main that was in conflict with a municipal sewer project to relocate sewer and drain lines in Pleasant Street and surrounding area. Methuen extended its plan unexpectedly, changing the location for the new sewer line. This created additional conflict with underground facilities, requiring Bay State to move and replace more main than expected. Additional excavation and backfilling expenses were incurred. Initial estimate of 1784 feet increased to 3033 feet of newly installed replacement pipe.								
51	1998	**Pembroke / Oldham St.**	$280,000	$279,662	$338	0%	$294,470	B98D5065
52	1998	**Holbrook / South Franklin St.**	$142,578	$154,614	$12,036	8%	$165,894	B98D5062
53	1998	**Raynham / New Cape Highway**	$97,531	$102,053	$4,522	5%	$104,006	B98D5059
54	1998	**Brockton / Menlo St.**	$82,728	$197,534	$114,806	See Justification	$212,835	B98D5056
Justification for Cost Variance– List No. 54: CAST IRON MAIN. Project was required because of subsurface disturbance to cast iron main (c. 1903-1904) due to road reconstruction. Initial estimate to install 2886 feet of new main, but actually installed 4199 feet. During construction, a culvert was discovered that added additional work and expense. Initial estimates also expected no resurfacing costs, but Brockton did require a $14,211 paving contribution on this job.								
55	1998	**Seekonk / Newman Ave.**	$174,456	$233,574	$59,118	See Justification	$250,161	B98D5034

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Justification for Cost Variance– List No. 55: BARE STEEL MAIN/SYSTEM DELIVERABILITY. Combined with state reconstruction planned for Newman Ave. in Seekonk, aka Route 152, this project was to replace deteriorating bare steel with a new. Post-estimate State permit required installation of temporary asphalt pavement. In addition, extra depth construction was required in some areas to accommodate future drain construction.								
56	1998	Holbrook / Union St.	$100,664	$265,256	$164,592	See Justification	$280,470	B98D5032
Justification for Cost Variance– List No. 56: BARE STEEL MAIN. Project estimate based on installing 2730 feet of main, in conjunction with street reconstruction, to replace deteriorating bare steel. However, additional new main was installed in Cottage St., Platts St., Summer St. and Winter St., totaling new main installation of 4758 feet (174% more new main than originally estimated). Because of the unexpected level of deterioration, more replacement was necessary, which caused Bay State's work to lag behind the completion of street reconstruction. Completion costs were incurred.								
57	1998	Franklin / Lincoln & Main St.	$401,895	$377,489	($24,406)	-6%	$420,298	B98D5023
58	1998	Taunton / Cooper Square	$153,697	$118,125	($35,572)	-23%	$132,192	B98D5021
59	1998	Franklin / King St.	$131,129	$143,466	$12,337	9%	$160,550	B98D5012
60	1998	Brockton / Warren Ave.	$144,073	$262,762	$118,691	See Justification	$308,990	B98D5006
Justification for Cost Variance– List No. 60: BARE STEEL AND CAST IRON MAIN. Combined with Brockton's planned reconstruction of Warren Ave., project was to replace deteriorating bare steel and cast iron main. Original estimate did not anticipate significant underground congestion of utility services, forcing constant rerouting. Nor did it expect side street tie ins at extra depth due to regrading. Finally, the road surface was thicker than normal, supported by a concrete layer beneath the asphalt, increasing work to expose the old pipe and install new.								
61	1997	Springfield / Boston Rd.	$325,240	$503,881	$178,641	See Justification	$601,611	S97D1006
Justification for Cost Variance– List No. 61: MAIN REPLACEMENT. In conjunction with state reconstruction of heavily traveled Boston Road, project installed 11,428 feet of main and retired 15,044 feet. A new regulator vault was added in the area during the project under a separate authorization. The project estimate included just the main run of pipe (excluding tie ins), but abandoning main and reconfiguring the distribution system for continued service required an unexpectedly high number of tie ins. Construction permitting required 7400 feet of pavement saw cutting (a more expensive method), and subsurface contained a combination of asphalt and reinforced concrete layers approximately 19" deep. Finally, an unexpected change in the grade of part of Boston Road required Bay State to lower approximately 250 feet of 6" pipe to maintain sufficient cover, another unanticipated cost.								
62	1997	Easthampton / Main St.	$160,720	$207,746	$47,026	See Justification	$223,035	S97D1003
Justification for Cost Variance– List No. 62: BARE STEEL, CAST IRON AND WROUGHT IRON MAIN. Because of road reconstruction, over 8000 feet of cast iron, wrought iron and bare steel mains were slated for replacement. After authorization and construction had commenced, it was determined, based on the condition of the pipes, that an additional 2706 feet of new pipe should be installed in seven side streets. A mix of changes in the Town street reconstruction plan and poor pipe condition (esp. in side streets) required unexpected modification and expansion of the project.								
63	1997	Easthampton / Holyoke St.	$69,815	$112,086	$42,271	See Justification	$130,473	S97D1001
Justification for Cost Variance– List No. 63: CAST IRON MAIN. State funded road replacement project complemented replacement of cast iron main in Holyoke St. Holyoke St. is state highway Route 141 in Easthampton: the road base is 8 inch thick reinforced concrete. In order to reach its pipe, the road was sawcut and spoils were trucked away. Much heavier than anticipated traffic along the route required additional police details (Easthampton and surrounding towns, as well as State Troopers) for worker safety and traffic discipline along the state highway worksite.								
64	1997	Lawrence /	$89,515	$160,506	$70,991	See Justification	$179,680	L97D0040

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		Arlington St.						
Justification for Cost Variance– List No. 64: CAST IRON MAIN. Replacement in response to municipal construction nearby. Overrun occurred because 8" diameter line in Arlington Street, at MAOP of 200 psig, when exposed was observed to rest too shallow. Correction required unanticipated cost of installing 350 feet of new main at proper depth.								
65	1997	**Methuen / Oakland Ave.**	$119,279	$144,556	$25,277	See Justification	$151,820	L97D0012
Justification for Cost Variance– List No. 65: MAIN REPLACEMENT. Estimated for main replacement to take place in conjunction with municipal street reconstruction of Route 28, the project authorization did not include numerous short connections to crossing mains.								
66	1997	**Lawrence / Broadway & Methuen**	$401,246	$314,402	($86,844)	-22%	$348,419	L97D0011
67	1997	**Easton / Main St.**	$278,878	$424,783	$145,905	See Justification	$460,980	B97D5086
Justification for Cost Variance– List No. 67: BARE STEEL MAIN/ MAIN REPLACEMENT/SYSTEM DELIVERABILITY. In conjunction with reconstruction of Main St, Easton, deteriorating bare and coated steel main was replaced with 8" lines to deliver gas from Easton LNG facility. Costs increased when it was discovered Main St. had a 7" layer of asphalt over a 7" layer of concrete for more than one quarter mile of the project. The post-estimate state highway permit required saw cutting and spoils replaced with flowable fill. Permit also required temporary paving, which required Bay State to re-excavate 7" of temporary pavement and replace it with permanent infrared treated patch. None of this was expected, as the activity of street reconstruction had initially been anticipated to dovetail with paving and relieve Bay State of that cost.								
68	1997	**Medway / High St.**	$687,000	$602,204	($84,796)	-12%	$675,866	B97D5020
69	1996	**Methuen / Pelham St.**	$132,191	$161,065	$28,874	See Justification	$163,026	L96D0034
Justification for Cost Variance– List No. 69: CAST IRON MAIN. Near Aegean Dr., Pelham St. had been regraded since the cast iron main was installed, and construction crews encountered an old street four feet below the current road. Bay State's cast iron main was three feet below that. New connections to piping required a deeper than expected trench (7 feet deep)and special shoring. In addition, tie in costs were underestimated. Finally, the excavation ran into ledge, slowing the project and requiring removal at extra cost. A longer term of police details was incurred as project slowed.								
70	1996	**Taunton / Williams St.**	$154,937	$126,388	($28,549)	-18%	$131,005	B96D5060
71	1996	**Hanover / Main St.**	$190,512	$124,656	($65,856)	-35%	$132,706	B96D5059
72	1996	**Brockton / Sawtell Ave.**	$147,900	$137,510	($10,390)	-7%	$155,653	B96D5031
73	1996	**Brockton / Belmont St.**	$313,429	$348,531	$35,102	See Justification	$390,718	B96D5027
Justification for Cost Variance– List No. 73: BARE STEEL AND CAST IRON MAIN. Project to replace over 8500 feet of deteriorating bare steel and cast iron main in conjunction with municipal street reconstruction on Belmont St., Route 123. Estimate did not include concrete street cutting and removal; city permits were conditioned to allow night work only.								
74	1996	**Brockton / Main & Pleasant St**	$148,000	$220,587	$72,587	See Justification	$251,568	B96D5009
Justification for Cost Variance– List No. 74: CAST IRON MAIN. Project to replace 4382 feet of deteriorating cast iron main completed at night as conditioned by post-estimate city permit. Night work increases labor costs, required portable lighting. In addition, concrete, cobblestones and railroad ties concealed under pavement had to be removed, sized and trucked for disposal at additional cost								

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75	1996	**Avon / E. High St.**	$156,216	$224,468	$68,253	See Justification	$249,350	B96D5004
Justification for Cost Variance– List No. 75: BARE STEEL MAIN. With street reconstruction, project to replace 3360 feet of bare steel main. The original estimate was prepared with expectation that main could be laid off-street, avoiding street opening and resurfacing costs. Town unexpectedly claimed off-pavement corridor for a proposed water main. The Town's permit was conditioned on the new main placed under pavement. Cost overruns were attributable to the change in location.								
76	1995	**Springfield / Belmont Ave.**	$186,160	$284,840	$98,680	See Justification	$323,463	S95D1025
Justification for Cost Variance– List No. 76: CAST IRON MAIN. Project to replace over 5200 feet of cast iron main in conjunction with street reconstruction in Belmont Ave. (aka Route 83 and 116). Unanticipated was the higher than expected cost of connecting mains in side streets due to the higher than expected individual connections that were required. Additional costs were incurred due to rerouting and delays caused by conflicts with other underground facilities.								
77	1995	**Ludlow / East St.**	$135,070	$212,468	$77,398	See Justification	$310,888	S95D1005
Justification for Cost Variance– List No. 77: CAST IRON MAIN. Project estimated on replacement of about 5200 feet of cast iron main in concert with a sewer separation construction project in Ludlow. Original estimate undercount the tie-ins necessary to side streets and did not contemplate replacing pipe on two longer side streets, where an additional 855 feet of 6 inch pipe was installed. MADTE regulations required replacement of cast iron pipe exposed or endangered by nearby construction. Additional costs were incurred because ledge was unexpectedly encountered along East St. in the line of main and trench assigned to the replacement pipe. Excavation required specialized equipment and extra labor charges. Removed ledghad to be hauled away and disposed of,and trench backfilled with processed gravel. :Longer police details were required for worker safety and traffic control along the site.								
78	1995	**Springfield / Parker St.**	$129,515	$147,065	$17,550	See Justification	$193,588	S95D1002
Justification for Cost Variance– List No. 78: BARE STEEL AND CAST IRON MAIN. The project, designed to replace a mix of deteriorating bare steel and cast iron pipe in Parker Street in advance of street reconstruction, was estimated at 5280 feet but in total 6848 feet were installed. 18 unanticipated side street tiens (some extensive) were required to put the Parker St. main in service. Thirty percent more main was installed than estimated.								
79	1995	**Walpole / Main St.**	$161,060	$305,799	$144,739	See Justification	$329,251	B95D5060
Justification for Cost Variance– List No. 79: BARE STEEL. In conjunction with planned reconstruction of Main St. (Route 1A), Walpole, project would replace 4" bare steel line, installed in 1927, with plastic. State highway permit required stringent surfacing standards: a temporary 3" patch for the full length of trench; after 90 days the temporary patch and 4" of fill had to be removed and replaced with a 4" base layer and a second 3" finish layer; and, for the permanent pavement, the trench edge had to be cut back, ground and treated with infrared heat to bind the new pavement to the old. In addition, since the project passed Cobb Pond and the Neponset River, a wetlands permit was required. Town permits added conservation and traffic control measures beyond those normally imposed. Finally, the crews exhumed human bones buried in the main route during construction, delaying the project for investigation, proper treatment and removal.								
80	1995	**Taunton / Hart St.**	$123,630	$113,553	($10,077)	-8%	$125,640	B95D5059
81	1995	**Taunton / Short St.**	$163,650	$143,168	($20,482)	-13%	$146,546	B95D5048
82	1995	**Holbrook / Quincy St.**	$170,610	$149,434	($21,176)	-12%	$158,812	B95D5043
83	1995	**Medway / Main St.**	$174,350	$149,488	($24,862)	-14%	$171,793	B95D5008
84	1995	**Brockton / MBTA Relocation 16"**	$131,800	$154,513	$22,713	See Justification	$159,523	B95C0004

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Justification for Cost Variance– List No. 84: MAIN RELOCATION. As part of an MBTA conversion of an existing freight line to a passenger line, a Bay State easement with a 12" line along the tracks became an issue, so the MBTA revoked the easement. This line was a major feed into the Brockton distribution system. The previous line was abandoned in place and rapidly replaced by installing a new line in the street. Abandoning the main was more costly than estimated because of limitations imposed by the MBTA: all work was done at times dictated by the MBTA, usually on weekends. The project also unexpectedly warranted a 24/7 flagger to warn oncoming freight trains of the location of the construction site, for worker safety and safe train passage.								
85	1995	**Brockton / Elliot St.**	$625,000	$437,022	($187,978)	-30%	$453,665	B95C0003
86	1995	**Brockton / MBTA Bridge**	$225,303	$250,729	$25,426	See Justification	$267,168	B95C0002
Justification for Cost Variance– List No. 86: MAIN RELOCATION. As part of an MBTA conversion of an existing freight line to a passenger line, a Bay State easement with a 12" line along the tracks became an issue, so the MBTA revoked the easement. A bridge over the Conrail tracks was being rebuilt to allow passage of the passenger trains; Bay State had a main crossing over the bridge that had to be removed during reconstruction. The main was run in Plain St. to coordinate with other work caused by MBTA's extinguishment of the easement. As with List No. 84, much of this work was confined to MBTA requirements, meaning working on weekends, discontinuities between work areas; required use of flaggers. The depth of tie ins to existing lines around the easement were extraordinarily deep, requiring construction of shoring for worker safety.								
87	1995	**Brockton / Intervale St.**	$160,000	$170,281	$10,281	6%	$183,476	B95C0001
88	1994	**Springfield / St. James Ave.**	$122,410	$178,695	$56,285	See Justification	$220,638	St. James Ave.
Justification for Cost Variance– List No. 88: CAST IRON MAIN. City of Springfield planned street reconstruction prompted 2700 foot cast iron main replacement. The new main route rathrough congested city streets and the construction crew repeatedly encountered conflicts with existing underground facilities, requiring changes in the planned route. The changes resulted in a significant amount of work to be moved under a concrete sidewalk that itself first had to be removed, then later repaired.								
89	1994	**Randolph / North Main**	$190,400	$129,927	($60,473)	-32%	$107,520	No. Main
90	1994	**Lawrence / Brookfield St.**	$288,075	$130,775	($157,300)	-55%	$147,960	Brookfield St.
Justification for Cost Variance– List No. 90: SYSTEM DELIVERABILITY. With the state's demolition of the White Pumps Bridge over the Merrimac River , this project abandoned the line on the bridge and constructed a new line to bypass the bridge. In doing so and installing new 12" main in various South Lawrence streets, Bay State improved distribution system pressures and eliminated problems associated with exposed pipe on bridges.								
91	1994	**Lawrence / Andover Street**	$256,103	$259,691	$3,588	1%	$296,852	L94D0003
92	1994	**Wrentham / East St.**	$379,015	$576,167	$197,152	See Justification	$618,100	B94D5052
Justification for Cost Variance– List No. 92: BARE STEEL MAIN. The project was the second phase of construction to replace deteriorating bare steel under Route 140 in Wrentham. Pre-construction estimate and authorization were based on a routing that assumed off-pavement construction. The Mass Highway permit was conditioned on the main being installed in the roadway, under pavement and specified that the street would be saw cut, and all trenches would be backfilled with flowable fill. Excavated soil and street spoils were hauled for disposal. State also required Bay State to re-excavate 7" of temporary pavement and replace it with permanent patch, infrared treated, all at unanticipated extra cost.								
93	1994	**Franklin / East**	$65,130	$113,094	$47,964	See Justification	$125,689	B94D5023

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		Central St.						
Justification for Cost Variance– List No. 93: BARE STEEL MAIN. Coordinated with planned municipal street construction inEast Central St., downtown Franklin, project was to address deteriorating bare steel main. The initial estimate anticipated ledge and boulder removal along the route. However, extra police details in the Town center were necessary to ensure worker safety, public passing and traffic control. Because the project estimate assumed street reconstruction, estimates only included an expectation of a trench topping of 2" temporary pavement. However, street reconstruction was delayed, backfill with flowable fill was required, and excavated soil had to be removed and disposed of. Permanent repaving was also at higher cost.								
94	1994	**Wrentham / East Street**	$104,750	$146,018	$41,268	See Justification	$155,143	B94D5020
Justification for Cost Variance– List No. 94: BARE STEEL MAIN. Project to replace deteriorating bare steel nder Route 140 in Wrentham. Estimate included assumed routing and construction in the shoulder of the road (off pavement). State highway permit specified inroadway construction, saw cutting of the street, and use of flowable fill in all trenches. Excavated trench soil and street spoils were removed for disposal. Permit also required re-excavation of 7" of temporary pavement in favor of a permanent, infrared treated patch.								
95	1994	**Canton / Pleasant St.**	$262,323	$206,997	($55,326)	-21%	$224,674	B94D5008
96	1994	**Brockton / Copeland St.**	$316,955	$284,382	($32,573)	-10%	$301,814	B94D5005
97	1994	**Brockton / Commercial Yard**	$600,000	$427,767	($172,233)	-29%	$545,453	B94C0003
98	1994	**Seekonk / Arcade Ave.**	$137,750	$146,345	$8,595	6%	$155,543	B94C0002
99	1994	**Brockton & Avon / MBTA Relocation 12"**	$769,765	$1,010,446	$240,681	See Justification	$1,065,314	B94C0001
Justification for Cost Variance– List No. 99: MAIN REPLACEMENT. As part of an MBTA conversion of an existing freight line to a passenger line, a Bay State easement with a 12" line along the tracks became an issue, so the MBTA revoked the easement, which supported a major feed into the Brockton district distribution system. Replacement included installation of a new 16" main near Meadow Lane and new 12" main in north Brockton and Avon. Because of time constraints involved, and limitations put on construction conditions, contractor bids came in higher than anticipated. Almost 10,500 feet of main were installed in North Montello St., Brockton, and Memorial Dr. and East Main St., Avon (each is a state highway, Route 28). Permit conditions for work in Route 28 were stringent, including mandating use of flowable fill and excavation and disposal of soils and street spoils. Initial estimates and engineering design anticipated shoulder or berm construction, but Avon's Water Department claimed the shoulder, requiring Bay State's competing main to be placed in the street: This increased resurfacing costs and police detail charges.								
100	1993	**Chicopee / Memorial Ave.**	$206,000	$268,971	$62,971	See Justification	$325,039	Memorial Ave.
Justification for Cost Variance– List No. 100: BARE STEEL MAIN. Poor condition 8" diameter bare steel main in Memorial Dr., Chicopee, was replaced. The project was estimated based on off-pavement construction, but the permit issued required installation in the breakdown lane of Route 33. Increased charges to break pavement, to haul away street spoils and to repave over trench resulted.								
101	1993	**Seekonk / Taunton Ave.**	$121,395	$129,381	$7,986	7%	$136,974	Taunton Ave.
102	1993	**Brockton / N. Cary**	$148,475	$134,512	($13,963)	-9%	$153,802	No. Cary
103	1993	**Andover / Holt Rd.**	$103,429	$102,481	($948)	-1%	$105,654	Holt Road
104	1993	**Brockton / Dover St.**	$125,745	$100,062	($25,683)	-20%	$110,645	Dover Street

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105	1992	Brockton / Torrey St.	$186,890	$184,405	($2,485)	-1%	$221,184	Torrey St.
106	1992	Marshfield / Ocean St.	$159,000	$168,073	$9,073	6%	$188,344	Ocean St.
107	1992	Hanson / Maquan St.	$349,600	$115,401	($234,199)	-67%	$137,954	Maquan St.