ARIZONA SHRP GYRATORY PROJECTS

From 1993 until 1996 the Arizona Department of Transportation (ADOT) Materials Group in cooperation with the Federal Highway Administration (FHWA) designed and built a number of Strategic Highway Research Program (SHRP) test sections. These test sections focused on designing hot mix and asphalt (HMA) using the SHRP gyratory compactor. The location and layout of the test sections can be found in ADOT publication " Arizona SHRP/PBA/SST/Test Section Layouts". Additional detailed information and support data on many of these test sections can be found in ASTM publication STP 1322 under papers written by Don Corum and George Way.

As calendar year 1996 came to a close it was decided that ADOT would move from a test section phase to a pilot project phase of evaluation and implementation of the SHRP gyratory method of HMA mix design. This publication contains a list of 1997 and 1998 projects that were built using the SHRP gyratory mix design method. Figure 1 shows typical aggregate gradings used for 25mm (one inch) and 19mm (3/4 inch) coarse graded mixes. Figure 2 shows the gradation for 19mm (3/4 inch) fine graded mixes. The attached project list shows a substantial amount of information about each project. The design of the mixes and subsequent list development is under the direction of Dr. Julie Nodes. Questions about these projects and supporting data should be directed to her at the following communication addresses, Phone 602 -712-8150, Fax 602-712-8415 . If Julie is unavailable you can also contact Dan Simpson at Phone 602-712-8201, Fax 602-712-8415.

ADOT is continuing to evaluate the SHRP gyratory mix design method. Future implementation will depend upon development of a complete gyratory specification, more equipment and trained technicians within ADOT, greater level of support by industry and consultants, increased availability of equipment and trained technicians. In addition the AASHTO specification continues to change and until this process is substantially completed full implementation by ADOT will be difficult. Nevertheless, ADOT is headed in the direction of eventual full and complete implementation.

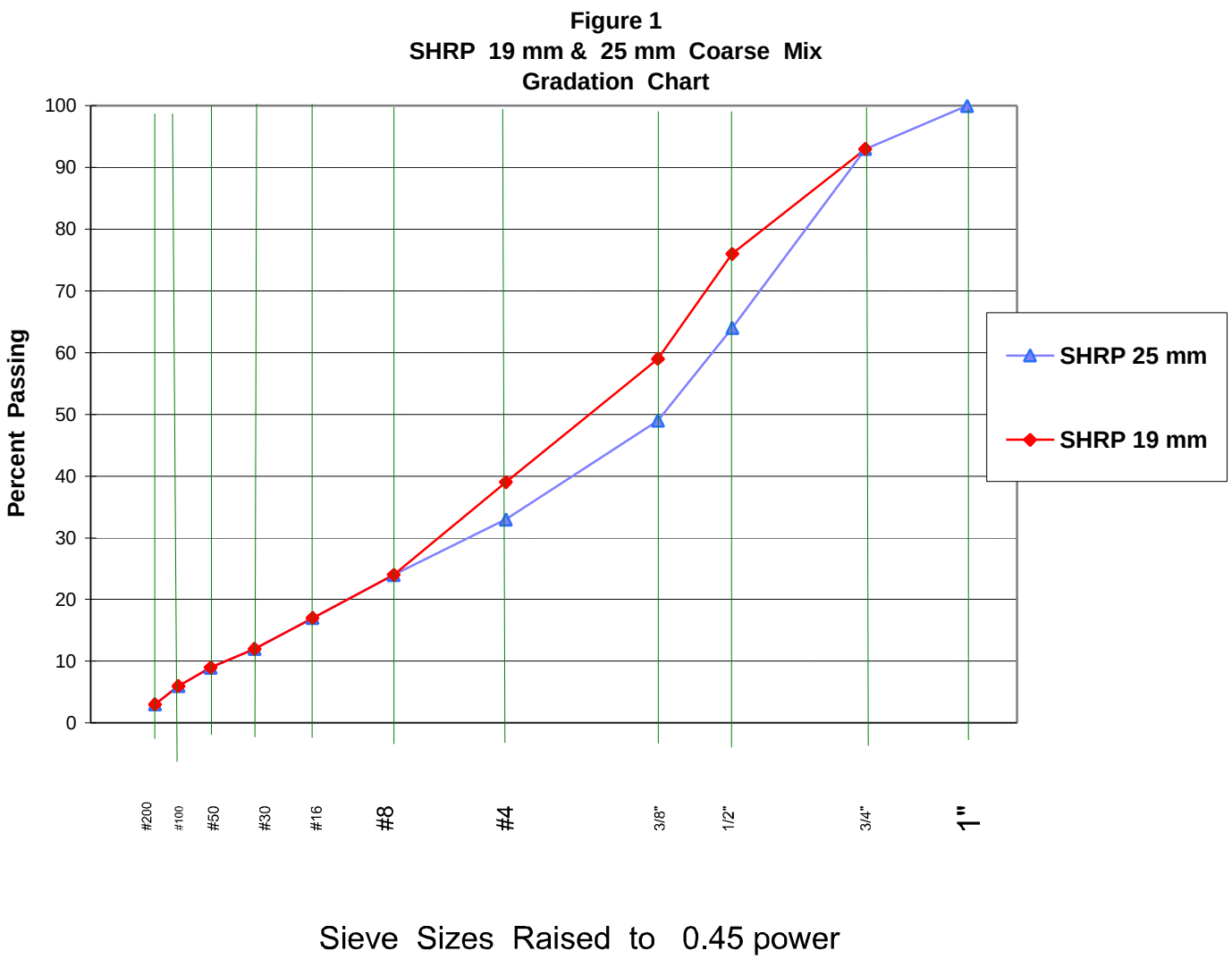
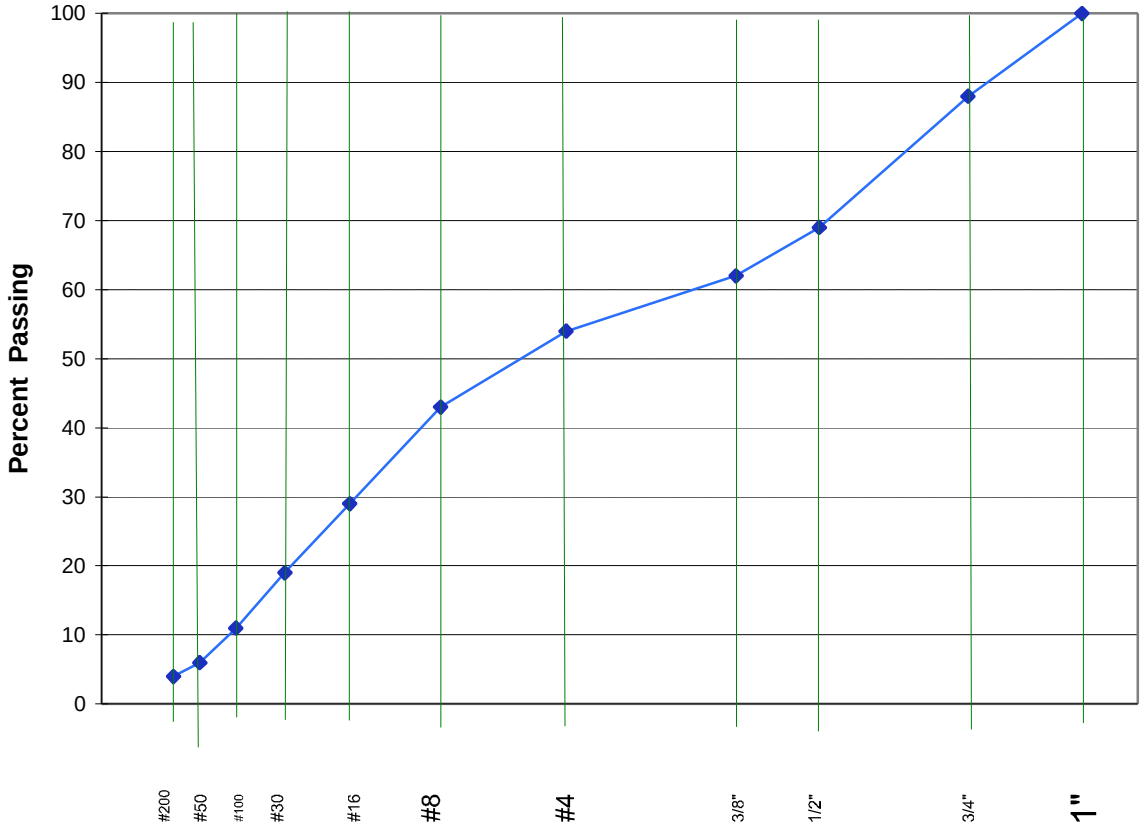


Figure 1
SHRP 19 mm & 25 mm Coarse Mix
Gradation Chart
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
#200
#100
#50
#30
#16
#8
#4
3/8"
1/2"
3/4"
1"
SHRP 25 mm
SHRP 19 mm
Sieve Sizes Raised to 0.45 power

Figure 2
SHRP 19 mm Fine Mix
Gradation Chart



Sieve Sizes Raised to 0.45 power

SHRP Projects , completed , at a glance

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP
IM-10-1(87)	H404501C	Dome Rock -Quartzsite	FNF	1998	10	11.7	24.0
IM-10-3(272)	H356201C	Chandler-Riggs*	Pulice	1997	10	160.3	167.1
IM-10-5(75)	H384701C	Marsh Station - Cienga	CS McCrossan	1997	10	290.2	296.2
IM-17-1(329)	H391301C	New River-Moores Gulch	FNF	1998	17	232.0	238.2 NB 238.6 SB
IM-17-1(228)	H381301C	Black Canyon TI- Sunset Point	FNF	1997	17	245.0 NB only	250.4 NB only
IM-17-1(327)	H400701C	Sunset Point-Badger Springs	FNF	1998	17	252.51	256.1
IM-19-1(125)	H379801C	Tubac-Chavez	Ashton Co.	1998	19	21.1	25.3
IM-40-4(84)	H420901C	California State Line - Needle Mt.	Granite	1997	40	0.12	2.40
IM-40-4(83)	H390601C	Lake Havasu - Franconia	Cox Rock	1998	40	8.3	14.0 EB 16.0 WB
IM-40-2(120)	H380801C	Pinevetta-Ashfork	Meadow Valley	1998	40	139.3	144.3
IM-40-4(149)	H391101C	Minnetonka-East	FNF	1997	40	259.05	268.1
IM-40-5(98)	H381201C	Big Litho - County Line	FNF	1997	40	303.80	305.20
F-022-2(49)	H380401C	San Domingo-Morristown	Granite	1998	60	117.8	122.1
F-022-2(509)	H400301C	Morristown - Wittman	FNF	1998	60	122.05	128.7
F-023-1(23)	H381601C	Jct SR 85/ I-10	Bentson Const.	1998	85	150.5	153.92
F-023-1-524	H380101C	Tonopah Rd. - Jct SR 85S	Bentson Const.	1998	85	149.22	150.48
F-037-1(24)	H202201C	Deadman Flat - Wupatki	FNF	1998	89	434.0	442.0
F-039-1(33) ** & F-039-1(34)**	H390901C H398301C	Detrital Wash & Lake Mead- Detrital Wash	Pulice	1999	93	22.73 NB 29.0 SB	29.28 NB 36.17 SB
F-0395-1(35)	H286501C	Wash Br. - Kingman Unit II	Pulice	1999♦♦	93	64.7	70.3
F-035-1(18)	H274801C	Lava Rock Section	Ames Cons Inc.	1999♦♦	93	142.5	145.5
F-051-1(18)P	H379601C	Lyman Lake - South*	CS McCrossan	1997	180	377.2	386.3

* By change order
**These two projects combined under same contract
♦♦ This project currently in progress

I-10 SHRP Project locations

Chandler-Riggs

Dome Rock -Quartzsite

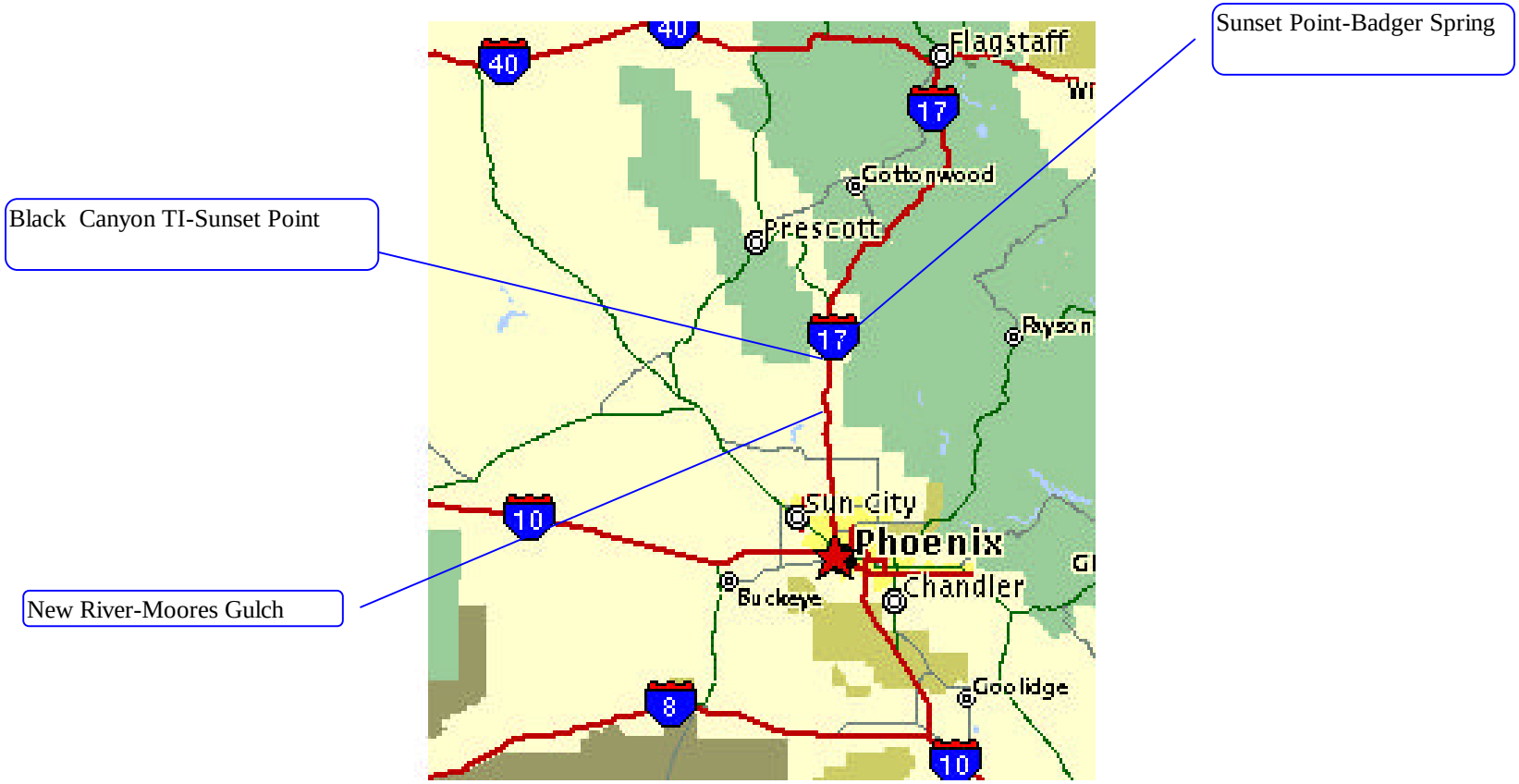
Marsh Station - Cienga

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-10-1(87)	H404501C	Dome Rock -Quartzsite	FNF	1998	10	11.7	24.0	48,000,000	1200’	44.1° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Koch 76-10 overlay 70-10 trench PAV=110° C	3/4” / 1” below RZ	9	135 @ 95%	220	AR-ACFC	2.5” SHRP (3/4”)	3” SHRP (1”) LL 5” SHRP (1”) RL

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-10-3(272)	H356201C	Chandler-Riggs*	Pulice	1997	10	160.3	167.1	51,000,000	1000’	42.9° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
		* By change order	Paramount 76-10 Ovrly 70-10 Trench PAV=110° C	1” below RZ	9	135 @ 95%	220	AR-ACFC	2.5” SHRP	3” SHRP L lane 4.5” SHRPR Lane

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-10-5(75)	H384701C	Marsh Station - Cienga	CS McCrossan	1997	10	290.2	296.2	45,000,000	3600’	39.5° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Chevron 70-16 PAV=110° C	1” below RZ	9	121 @ 95%	195	AR-ACFC	3” SHRP	2.5” SHRP L lane 4 ” SHRPR Lane

I-17 SHRP Project locations

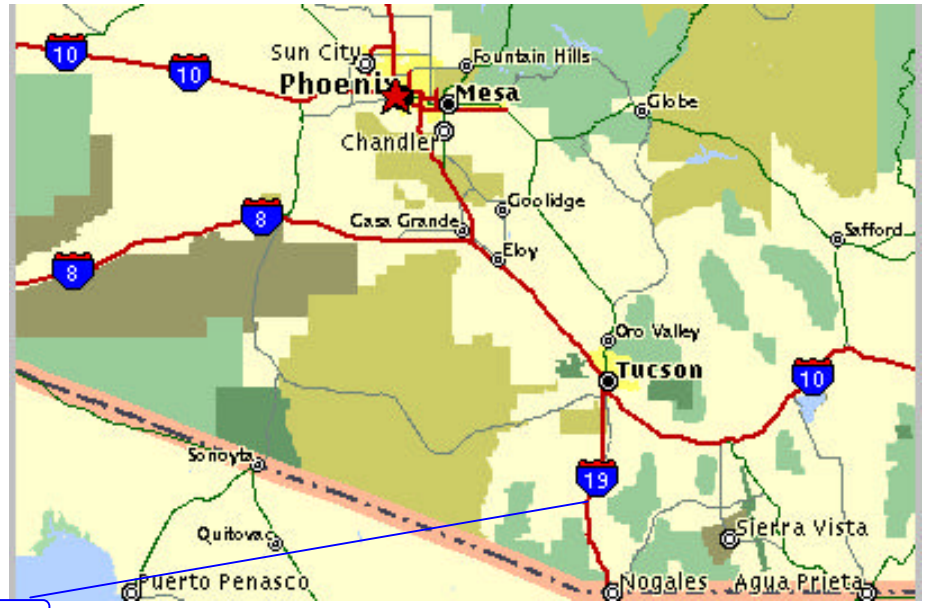


Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-17-1(329)	H391301C	New River-Moores Gulch	FNF	1998	17	232.0	238.2 NB 238.6 SB	32,000,000	2080	42.7° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Paramount 76-10 overlay 70-10 trench PAV=110° C	1" / 3/4" below RZ	9	135 @ 95%	220	AR-ACFC	2.5" SHRP (3/4") Mix	4.0 " SHRP (1") Mix R lane only

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-17-1(228)	H381301C	Black Canyon TI-Sunset Point	FNF	1997	17	245.0 NB only	250.4 NBonly	31,000,000	2300'	41.8° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Koch 76-10 PAV=110° C	1" below RZ	9	128 @ 95%	208	AR-ACFC	----------	3.0" to 6" SHRP

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-17-1(327)	H400701C	Sunset Point-Badger Springs	FNF	1998	17	252.51	256.1	25,000,000	2300'	39.7° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Paramount 70-16 PAV=110° C	1" below RZ	9	121 @ 95%	195	AR-ACFC	2"AR-AC	4.0" to 8" SHRP

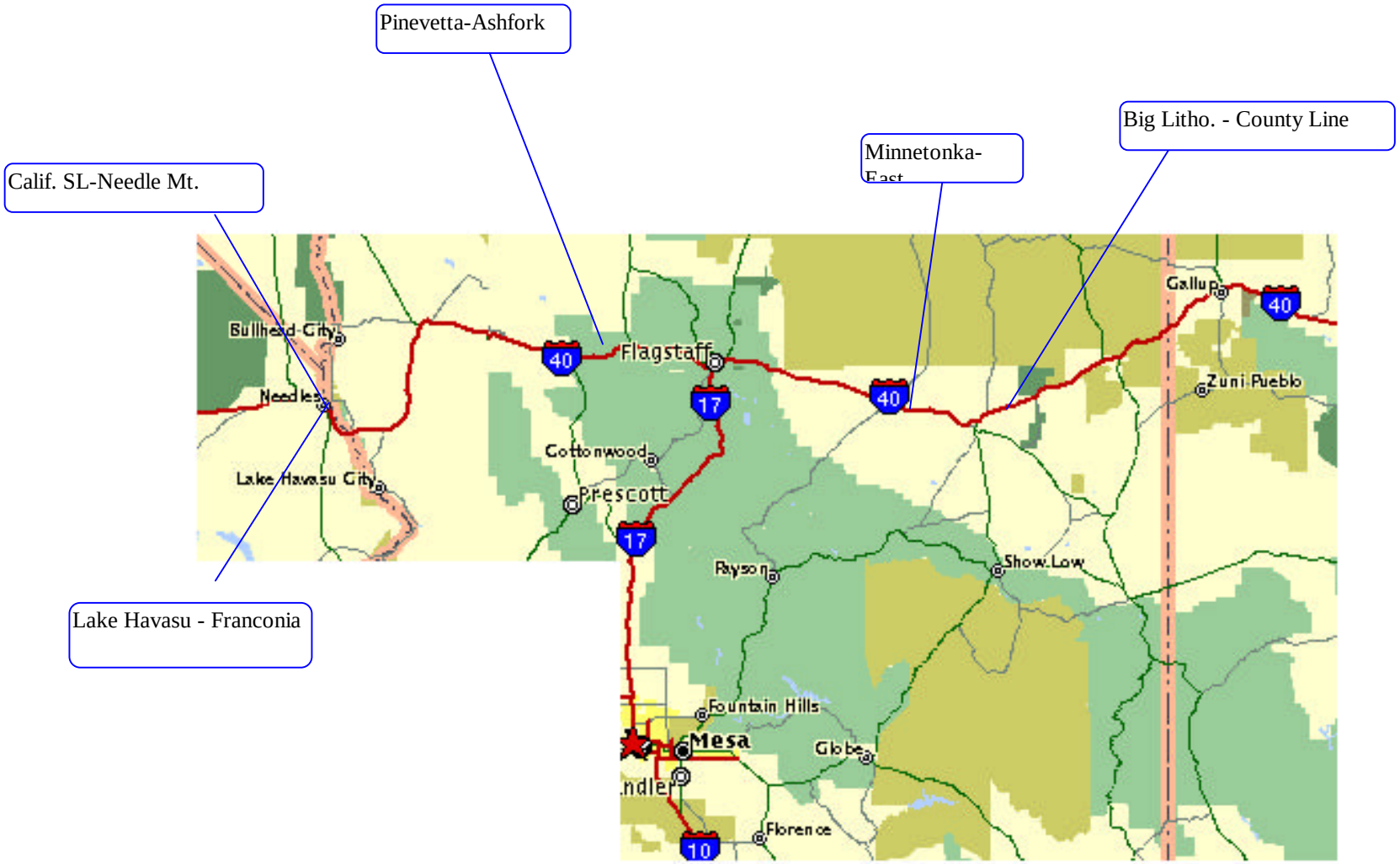
I-19 SHRP Project locations



Tubac-Chavez

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-19-1(125)	H379801C	Tubac-Chavez	Ashton Co.	1998	19	21.1	25.3	10,000,000	3276’	40.3° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Chevron 70-10 PAV=110° C	3/4” below RZ	8	100 @ 95%	158	AR-ACFC	----------	4” SHRP

I-40 SHRP Project locations



Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-40-1(84)	H420901C	Calif. SL-Needle Mt.	Granite	1997	40	0 .12	2.40	49,000,000	5272	46.7° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay *	Mill/Replace*
			Koch 82-10 PAV=110° C	1" below RZ	9	139 @ 95%	228	AR-ACFC	2.5" SHRP	3.0" to 7" SHRP

**Note: Due to construction problems, the entire overlay was removed. 1 1/2" of trench mix was milled / replaced with conventional ADOT 3/4" mix,overlayed with the same mix plus asphalt rubber friction course. PG 76-16 was used in the ADOT 3/4" mix.*

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-40-1(83)	H390601C	Lake Havasu -Franconia	Cox Rock	1998	40	8.3	14.0 EB 16.0 WB	48,000,000	870	45.6° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Petro Source 70-10 Overlay 76-10 Trench PAV=110° C	3/4" below RZ	8	109 @ 95%	174	AR-ACFC	3.0" SHRP	4" marshall WB R Lne 5" marshall EB R. Lane

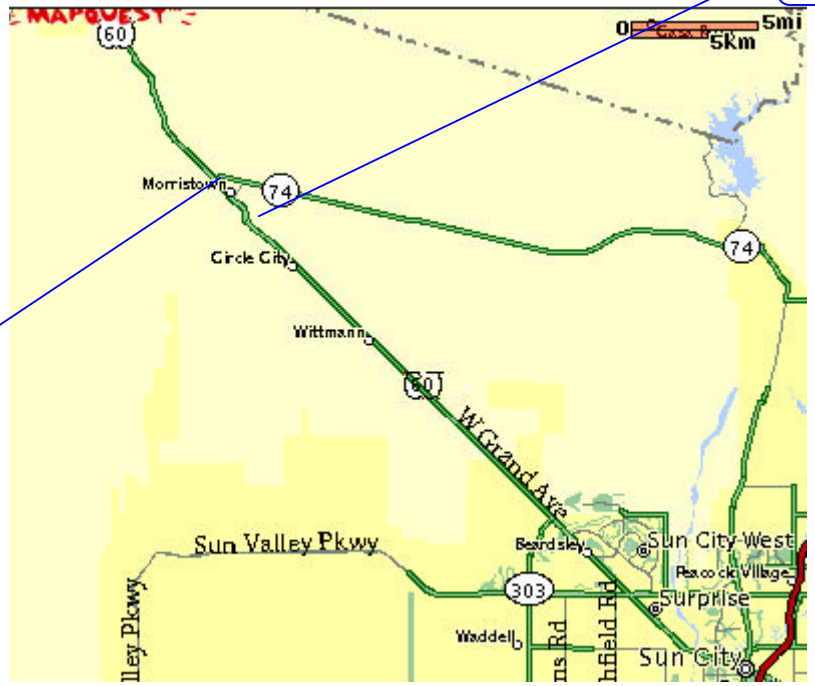
Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-40-2(120)	H380801C	Pinevetta-Ashfork	Meadow Valley	1998	40	139.3	144.3	46,000,000	5272	35.8° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Chevron 70-22 PAV=110° C	3/4" below RZ	8	109 @ 95%	174	AR-ACFC	2.5" SHRP	2.5" to 4.0" SHRP

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-40-4(149)	H381101C	Minnetonka-East	FNF	1997	40	259.05	268.1	66,000,000	4886	37.2° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Paramount 64-22 PAV=100° C	1" below RZ	8	109 @ 95%	174	AR-ACFC	2" ARAC	3.5" to 5.0" SHRP R. lane only

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
IM-40-5(98)	H381201C	Big Litho - County Line	FNF	1997	40	303.80	305.20	56,000,000	5272	36.7° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Paramount 64-22 PAV=100° C	1" below RZ	8	109 @ 95%	174	AR-ACFC	2" ARAC	3" SHRP L lane 5.0" SHRP R. lane

US 60 SHRP Project locations

Morristown - Wittman



San Domingo-Morristown

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
F-022-2(49)P	H380401C	San Domingo-Morristown	Granite	1997	60	117.8	122.1	6,000,000	1940’	42.5° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Navaho Western 70-10 PAV=110° C	1” below RZ	8	100 @ 95%	158	AR-ACFC	---	4.0” SHRP

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
F-022-2(50)P	H400301C	Morristown - Wittman	FNF	1997	60	122.05	128.7	6,000,000	1930’	42.5° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay **	Mill/Replace**
			Navaho Western 70-10 PAV=110° C	3/4” above RZ	8	100 @ 95%	158	Chip Seal*	2” SHRP	2.5” - 4.0” SHRP

* Chip Seal exhibited severe bleeding. Conventional ACFC was applied to project in January 1999.
** Overlay only in non-divided section. Mill/Replace only in divided section.

SR 85 SHRP Project locations

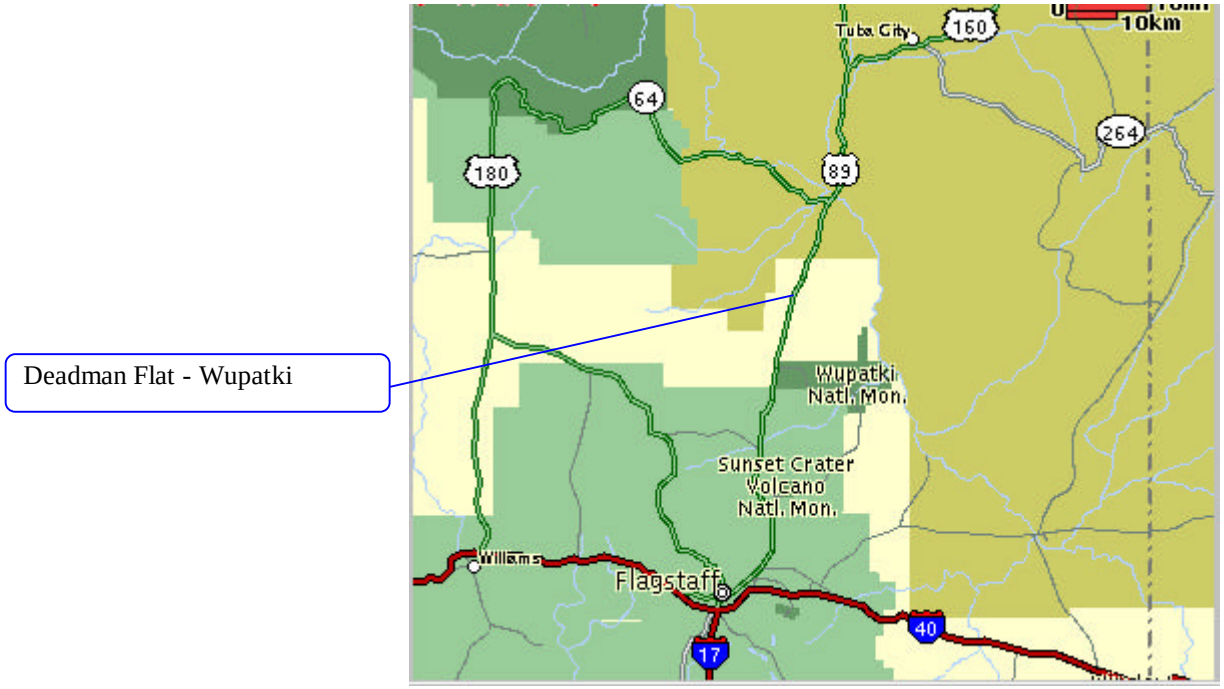
Tonopah Rd. -Jct SR 85S

Jct SR 85/ I-10

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
STP -023-1(23)P	H381601C	JCT SR 85 / I-10	Bentson Const.	97	85	150.5	153.92	14,000,000	857’	44.5° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Chevron 76-10 PAV=110° C	3/4” below RZ	9	135 @ 95%	220	AR-ACFC	2” SHRP	3” SHRP

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
F-023-1-524	H380101C	Tonopah Rd. -Jct SR 85S	Bentson Const.	97	85	149.22	150.48	14,000,000	950’	44.5° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Chevron 76-10 PAV=110° C	3/4” below RZ	9	135 @ 95%	220	AR-ACFC	3” SHRP	----------

US 89 SHRP Project locations



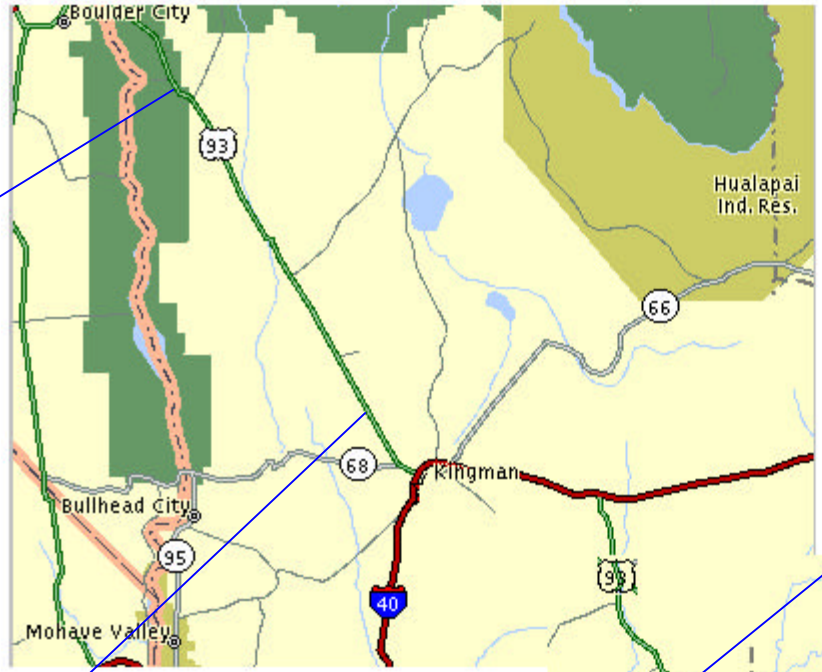
Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
F-037-1(24)P	H202201C	Deadman Flat - Wupatki	FNF	1998	89	434	442	11,000,000	6500’	33.7° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay *	Mill/Replace*
			Paramount 64-28 PAV=100° C	3/4’” below RZ	8	109 @ 95%	174	AR-ACFC	2.5”AR-AC	3” SHRP

**Note: the SB direction, 3" Mill/Replace SHRP Mix & 2.5" AR-AC overlay, ,1/2" AR-ACFC as surface course.*
The Northbound direction , 11" AB, 6" SHRP Mix , 1/2" AR-ACFC as surface course .

US 93 SHRP Project locations

Detrital Wash &
Lake Mead- Detrital Wash *

*These two projects combined under same contract



Lava Rock Section

Wash Br. -Kingman Unit II

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.

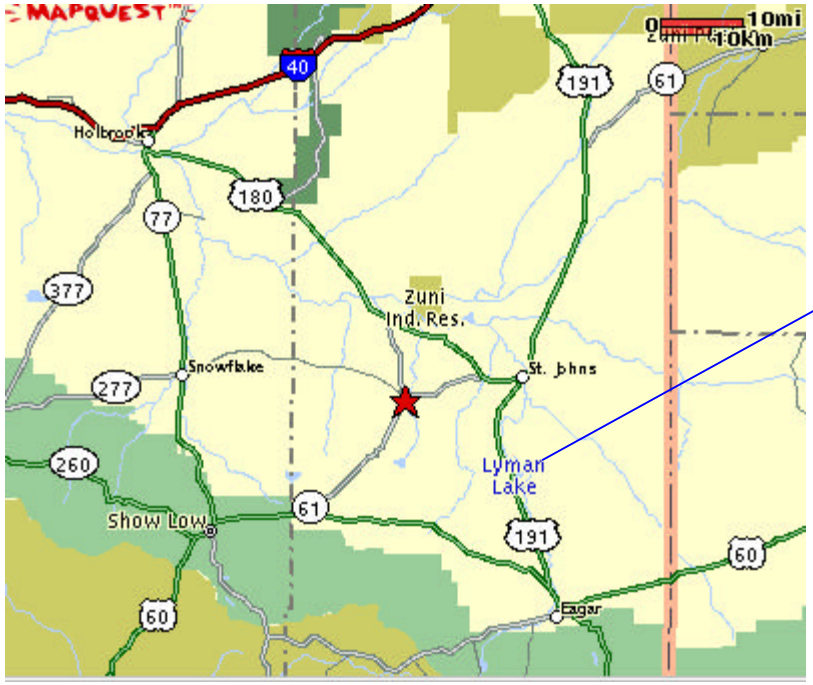
F-039-1(33) * F-039-1(34)*	H390901C H398301C	Detrital Wash Lake Mead- Detrital Wash	Pulice	1999	93	22.73 NB 29.0 SB	29.28 NB 36.17 SB	8,000,000	2347'	43.2° C
		*These two projects combined under same contract	PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
			Koch/Paramount 76 -10 PAV=110° C	3/4" below RZ	8	105 @ 95%	167	AR-ACFC	2.5" SHRP	2.0" SHRP NB only

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
F-0395-1(35)	H286501C	Wash Br. -Kingman Unit II	Pulice	♦♦	93	64.7	70.3	7,000,000 to 17,000,000	3300'	39.5° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	Overlay	AC Type
		♦♦ This Proj. currently in progress	Crown 76-16 PAV=110° C	3/4" below RZ	9	121 @ 95%	195	ACFC	2.5" SHRP	5.5" SHRP 3/4" Mix

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
F-035-1(18)	H274801C	Lava Rock Section	Ames Cons Inc.	♦♦	93	142.5	145.5	6,000,000	2200'	42.0° C
			PG Grade	SHRP Mix Size	Ninitial	Ndesign	Nmax	Surface Course	------	AC Type*
		♦♦ This Proj. currently in progress	koch 76-10 PAV=110° C	3/4" below RZ	8	113 @ 95%	181	ACFC*	------	5" SHRP 3/4" Mix

**Note: This is a new construction with AB and 5" SHRP 3/4" Mix*

US 180 SHRP Project location



Lyman Lake - South

Proj. Number	Tracs No.	Proj. Name	Contractor	Year Built	Route	BegMP	EndMP	20 Year ESAL	Elev.	Design Air Temp.
F-051-1(18)P	H379601C	Lyman Lake - South*	CS McCrossan	1997	180	377.2	386.3	3,000,000	6000’	33.6° C
			PG Grade	SHRP Mix Size	Ninitial**	Ndesign	Nmax	Surface Course	Overlay	Mill/Replace
		* By change order	Paramount 64-22 PAV=100° C	3/4” above RZ	7	76@ 95%	117	Double Seal Coat	2.5” SHRP	----------

** % Gmm @ Ninitial = 89.1%

The proposed SHRP upcoming projects* :

Project Number	Tracs No.	Project Name	Route	BegMP	EndMP
	H239001C	Pantano RR OP- Cienga Creek	10	288.6	
IM-17-2(122)	H421001C	Dugas TI - Cherry Rd. (Southbound)	17	269.25	277.50
I-19-1-428	H480401C	Pima Mine Road - Valencia	19	50.0	58.0
IM-40-4()	H443201C	Joseph City - Perkins Valley	40	277.4	283.0
F-022-2(58)	H457301C	Morristown RR OP - 203rd Ave.	60	123.49	130.9
STP-022-2(56)	H457301C	Deer Valley Road - Beardsley	60	136.9	138.82
M-951-4( )	H455901C	Thompson Ave. RR	66	57.7	
F-053-1(31)	H230601C	Sunflower-MP 226 Segment F	87	218.0	226.0
PLH-038-1(32)	H407601C	Resort Road - Devore	88	255.0	262.5
S-366	H274101C	Cornville Rd- Dry Creek	89A	357.1	359.9
F-039-1(55)	H422401C	Temple Bar Rd (SB)	93	16.0	18.2
F-035-1(44)	H426501C	Kaiser Spring Section	93	132.9	137.3
F-035-1(53)	H457201C	Boulder Section	93	145.5	152.1
F-035-1(55)	H492001C	Signal Section Phase 1 - Kaiser Spring	93	129.5	
F-063-1(12)	H441601C	San Luis - Gadsden	95	0.0	4.7
F-063-1(11)	H441501C	Gadsden - 32nd St.	95	4.7	19.59
F-038-1(35)	H447601C	MP 270- Jakes corner	188	270.0	
F-053-2	H469901C	Little Green Valley	260	260.10	267.10
F-053-2(22)	H316901C	Preacher Canyon	260	260.20	263.20
F-053-2	H447301C	Kohls Ranch	260	266.0	268.0
F-053-2(33)	H447201C	Christopher Creek	260	272.5	274.5

** Includes some projects that may be currently under contract but not completed yet.*