APPENDIX A
2001 MAINTENANCE SUPERVISOR SURVEY QUESTIONNAIRE

2001 Maintenance Supervisor Survey

First, how many years have you worked on asphalt pavement maintenance [altogether]?

Q:EASYTYPE
In the years you have worked in this field, what type of asphalt have you found easiest to maintain -- dense graded or open graded?

1 DENSE GRADED
2 OPEN GRADED
3 [IF VOLUNTEERED] OTHER

Q:EASYWHY
Why [is that asphalt easiest to maintain]?

Q:DIFFTYPE
What type of asphalt have you found most difficult to maintain -- dense graded or open graded?

1 DENSE GRADED
2 OPEN GRADED
3 [IF VOLUNTEERED] OTHER

Q:DIFFWHY
Why [is that asphalt difficult to maintain]?

Q:DISTRICT
What number is your ODOT maintenance district?

Q:LOCATE1
Does your maintenance work cover the entire district or just part of it?
PROBE: Your maintenance work in the past year or so.

Q:LOCATE2
What area in the District does your maintenance work cover?

Q:STRESS1
Now I need to ask you about several types of pavement distress on F-mix you have seen in your (district / area) in the past two years. For each one, please tell me whether you have seen it in your (district / area), and, if you have seen it, how prevalent that type of distress is on the highways where you work. I need to know if it is rare, scattered, or pervasive throughout your (district / area).

The first one is raveling.
PROBE: Have you seen raveling in your (district / area)?
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE: Raveling refers to the asphalt surface becoming irregular because the aggregate and asphalt binder has worn away. The surface texture is rough and pitted.

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS2
Have you seen clogging on F-mix pavement (in your district / area)?
PROBE: Clogging is when the asphalt is no longer porous and the voids are filling.
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS3
[(What about / Have you seen)] gouging or scarring [on F-mix pavement in your (district/area)]?
PROBE: For example, from snow plows.
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS4
[(What about / Have you seen)] deformation rutting from heavy trucks [on F-mix pavement in your (district / area)]?
PROBE: This refers to some trucks' heavy weight deforming the pavement into ruts.
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE
Q:STRESS5

[(What about/Have you seen)] rutting from studded tires [on F-mix pavement in your (district/area)]?
PROBE: This refers to studded tires (used for snow and ice) eroding ruts into the pavement surface.
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS6
[(What about / Have you seen)] thermal cracking or transverse cracks [on F-mix pavement in your (district / area)]?
PROBE: Temperature variations [like freeze-thaw] can cause this cracking.
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS7
[(What about / Have you seen)] alligator cracking [on F-mix pavement in your (district / area)]?
PROBE: An inadequate road structure can cause this all-over cracking [that looks like a puzzle].
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS8
[(What about / Have you seen)] reflective cracking [on F-mix pavement in your (district / area)]?
PROBE: This happens when a crack beneath an overlay spreads to the surface.
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS9
[(What about / Have you seen)] stripping [on F-mix pavement in your (district / area)]?

PROBE: Stripping is separation of the aggregate and the asphalt binder caused by the inability of the asphalt to stick to aggregate in wet conditions
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS10
[(What about / Have you seen)] fat spots becoming a problem [on F-mix pavement in your (district / area)]?
PROBE: For example, when there is too much asphalt binder in places.
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS11
[(What about / Have you seen)] icing problems [on F-mix pavement in your (district / area)]?
PROBE: That is, more icing than you would expect when compared to a dense graded pavement.
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS12
[(What about / Have you noticed)] a noisy ride [on F-mix pavement in your (district / area)]?
PROBE: Is the road unusually noisy as you drive over it?
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS13
[(What about / Have you noticed)] pot holes [on F-mix pavement in your (district / area)]?
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS14
[(What about / Have you noticed)] a bumpy ride [on F-mix pavement in your (district / area)]?
PROBE: Is the road unusually bumpy as you drive over it?
PROBE FOR YES: Is it rare, scattered, or pervasive [in your (district / area)]?
PROBE FOR YES: How prevalent is (it / that)?

1 NOT SEEN IT
2 RARE
3 SCATTERED
4 PERVASIVE

Q:STRESS15
Have you noticed any other pavement distresses on F-mix asphalt in your (district / area)?

1 YES
2 NO --> SKIPTO FOGSEAL

Q:STRSS15A
What are those [other distresses you have seen]?
PROBE FOR MULTIPLE ANSWERS: Which one is most common or problematic?

Q:STRSS15B
Is it rare, scattered, or pervasive [on F-mix pavement in your (district / area)]?

1 [DO NOT USE -CATEGORY REMOVED FOR CONSISTENCY WITH OTHER Q'S]
2 RARE
3 SCATTERED
4 PERVASIVE

Q:FOGSEAL
Do you ever use fog-seals on F-mix for maintenance in your (district / area)?
PROBE: Fog-seal is a thin liquid coating of asphalt that seals and rejuvenates asphalt binder.

1 YES
2 NO --> SKIPTO PREVEN1

Q:FOGPCT
What percentage of the F-mix paved roads are fog sealed in your (district / area)?
PROBE: Would you say fifty percent? Thirty-three percent? Twenty-five percent? Something else?

Q:FOGOFT
How often are those pavements fog-sealed, on average?
PROBE: Would you say every year, every three years, [every five years,] [or something else]?

Q:FOGLONG1
Do you have any convincing evidence that fog sealing prolongs the life of F-mix?

1 YES
2 NO --> SKIPTO FOGLONG2

Q:FOGLONGA
What is that [evidence that fog sealing prolongs the life of F-mix]?

Q:FOGLONG2
Do you have any convincing evidence that fog sealing does not prolong the life of F-mix?

1 YES
2 NO --> SKIPTO PREVEN1

Q:FOGLONGB
What is that [evidence that fog sealing does not prolong the life of F-mix]?

Q:PREVEN1
From your years of experience, what do you believe is the best preventative maintenance for F-mix?

Q:PREVEN2
Do you have any ideas about how preventative maintenance for F-mix could be improved?
PROBE FOR GEOGRAPHIC AREA: Anywhere F-mix is used [not just in your (district / area)].

1 YES
2 NO --> SKIPTO QUANT1

Q:PREVENA
What are those [ideas you have [for how to improve preventative maintenance for F-mix]]?

Q:QUANT1
[We are over halfway done with the survey now, and I would like to thank you sincerely for your time and effort so far.] Now, please think about your local suppliers of F-mix. If they are not already producing F-mix for a construction contract, will they provide you with less than sixty tons?
PROBE: Will they make you a special batch of F-mix that is less than 60 tons?

1 YES
2 NO --> SKIPTO SUCC1

Q:QUANT2
Will they supply you with less than thirty tons?

1 YES
2 NO --> SKIPTO SUCC1

Q:QUANT3
Will they supply you with less than ten tons?

1 YES
2 NO

Q:SUCC1
Now I need to ask you about the success of various maintenance techniques you use. The first one is screed patching with C-mix over F-mix. Generally speaking, is this maintenance technique not at all successful, not very successful, somewhat successful, or completely successful?
PROBE: By screed patching we mean using a box that you drag behind a truck to level a pile of material.

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC2
How successful is screed patching with D-mix over F-mix?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?
PROBE: By screed patching we mean using a box that you drag behind a truck to level a pile of material.

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC3
[(What about / How successful is)] blade patching with C-mix over F-mix?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?
PROBE: By blade patching we mean using grader blade, like a snowplow, to level a pile of asphalt.

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC4
[(What about / How successful is)] blade patching with D-mix over F-mix?
PROBE: [Generally speaking, is this maintenance technique]not at all successful, not very successful, somewhat successful, or completely successful?
PROBE: By blade patching we mean using grader blade, like a snowplow, to level a pile of asphalt.

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC5
[(What about / How successful is)] machine patching with B-mix over F-mix?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?
PROBE: By machine patching we mean using a paving machine.

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC6
[(What about / How successful is)] machine patching with C-mix over F-mix?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?
PROBE: By machine patching we mean using a paving machine.

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC7
[(What about / How successful is)] machine patching with F-mix over F-mix?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?
PROBE: By machine patching we mean using a paving machine.

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC8
[(What about / How successful is)] inlay patching with C-mix?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC9
[(What about / How successful is)] inlay patching with F-mix?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC10

(What about / How successful is) a procedure where you apply tack to the repair area, place open-graded rock in the repair area, spray with liquid asphalt, and then compact it.
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC11
[(What about / How successful is)] an emulsion chip seal?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC12
[(What about / How successful is)] hot asphalt chip seal?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC13
[(What about / How successful is)] crack sealing?
PROBE: Is this generally not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL

4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC14
[(What about / How successful is)] profiling with a grinder?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC15
[(What about / How successful is)] pot hole repair with pre-mix?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC16
[(What about / How successful is)] placing aggregate in a pothole, spraying with Percol, and letting it set?
PROBE: [Generally speaking, is this maintenance technique] not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [IF VOLUNTEERED] HAVE NOT USED
6 [IF VOLUNTEERED] IT DEPENDS

Q:SUCC17
Have you ever used any other kind of road maintenance technique in your (District/Area) [than those I just asked you about]?
NOTE: AT ANY TIME, ON ANY JOB

1 YES
2 NO --> SKIPTO WINMIX

Q:SUCC17A
What is that [other kind of road maintenance technique that you have used]?

Q:SUCC17B
Generally speaking, is this maintenance technique not at all successful, not very successful, somewhat successful, or completely successful?

1 NOT AT ALL SUCCESSFUL
2 NOT VERY SUCCESSFUL
3 SOMEWHAT SUCCESSFUL
4 COMPLETELY SUCCESSFUL
5 [DO NOT USE -CATEGORY REMOVED FOR CONSISTENCY WITH OTHER Q'S]
6 [IF VOLUNTEERED] IT DEPENDS

Q:WINMIX
I need to end the survey by asking you three open-ended questions. As you know, winter maintenance for F-mix presents different challenges than winter maintenance for dense-graded asphalt concrete pavements. What procedures have you found to be effective in maintaining F-mix pavements during the winter?
PROBE: Is there anything else?

Q:BEST
From your perspective, what is the one best thing about F-mix asphalt?

Q:IMPROVE
If there is one thing you could change or improve about F-mix, what would it be?

Q:ENDING
That is the end of the survey. On behalf of ODOT, I'd like to thank you sincerely for your time and opinions on these questions. Good-bye.

APPENDIX B
RESPONSES TO LIMITED CHOICE QUESTIONS, 2001 MAINTENANCE SUPERVISOR SURVEY

RECORD #	YEARS	EASYTYPE	DIFFTYPE	DISTRICT	LOCATE Entire	STRESS1	STRESS2	STRESS3	STRESS4	STRESS5	STRESS6	STRESS7	STRESS8	STRESS9	STRESS10
1	26	Dense Graded	Open Graded	1	Part	Scattered	Scattered	Pervasive	Rare	Scattered	Scattered	Scattered	Rare	Pervasive	Pervasive
2	17	Dense Graded	Open Graded	1	Entire	Scattered	Not Seen It	Pervasive	Scattered	Rare	Scattered	Scattered	Don't Know	Scattered	Scattered
3	15	Dense Graded	Open Graded	1	Entire	Pervasive	Pervasive	Pervasive	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Pervasive	Scattered
4	15	Dense Graded	Open Graded	1	Entire	Scattered	Scattered	Rare	Scattered	Pervasive	Rare	Rare	Scattered	Scattered	Scattered
5	10	Dense Graded	Open Graded	1	Part	Pervasive	Not Seen It	Scattered	Not Seen It	Scattered	Not Seen It	Scattered	Scattered	Not Seen It	Not Seen It
6	10	Dense Graded	Open Graded	3	Part	Rare	Pervasive	Scattered	Scattered	Pervasive	Scattered	Scattered	Scattered	Rare	Not Seen It
7	6	Dense Graded	Open Graded	3	Entire	Pervasive	Rare	Rare	Pervasive	Pervasive	Scattered	Pervasive	Scattered	Scattered	Scattered
8	30	Dense Graded	Open Graded	3	Entire	Scattered	Pervasive	Scattered	Rare	Pervasive	Scattered	Pervasive	Pervasive	Scattered	Scattered
9	32	Dense Graded	Open Graded	3	Part	Rare	Pervasive	Scattered	Scattered	Pervasive	Pervasive	Pervasive	Scattered	Scattered	Scattered
10	21	Dense Graded	Open Graded	3	Part	Scattered	Pervasive	Pervasive	Scattered	Pervasive	Rare	Pervasive	Scattered	Scattered	Pervasive
11	8	Dense Graded	Open Graded	4	Part	Scattered	Pervasive	Pervasive	Pervasive	Pervasive	Scattered	Scattered	Not Seen It	Scattered	Scattered
12	25	Dense Graded	Open Graded	4	Part	Scattered	Pervasive	Scattered	Scattered	Scattered	Scattered	Rare	Scattered	Rare	Scattered
13	21	Dense Graded	Open Graded	4	Part	Pervasive	Pervasive	Not Seen It	Pervasive	Pervasive	Pervasive	Scattered	Scattered	Pervasive	Scattered
14	20	Dense Graded	Open Graded	4	Entire	Pervasive	Pervasive	Scattered	Pervasive	Scattered	Scattered	Pervasive	Scattered	Scattered	Scattered
15	5	Dense Graded	Open Graded	4	Entire	Pervasive	Pervasive	Scattered	Scattered	Scattered	Scattered	Pervasive	Scattered	Scattered	Pervasive
16	29	Dense Graded	Open Graded	4	Part	Scattered	Pervasive	Scattered	Pervasive	Scattered	Scattered	Pervasive	Scattered	Not Seen It	Scattered
17	8	Dense Graded	Open Graded	5	Part	Scattered	Scattered	Scattered	Scattered	Scattered	Rare	Scattered	Rare	Pervasive	Pervasive
18	15	Dense Graded	Open Graded	5	Part	Pervasive	Pervasive	Pervasive	Pervasive	Pervasive	Pervasive	Pervasive	Pervasive	Pervasive	Scattered
19	24	Dense Graded	Open Graded	5	Part	Rare	Pervasive	Not Seen It	Not Seen It	Pervasive	Rare	Pervasive	Scattered	Rare	Scattered
20	16	Dense Graded	Open Graded	5	Part	Not Seen It	Pervasive	Rare	Rare	Not Seen It	Rare	Not Seen It	Not Seen It	Not Seen It	Not Seen It
21	0	No Preference	Don't Know	5	Entire	Rare	Don't Know	Don't Know	Don't Know	Pervasive	Don't Know	Scattered	Don't Know	Don't Know	Not Seen It
22	13	Dense Graded	Open Graded	5	Part	Scattered	Pervasive	Scattered	Scattered	Pervasive	Rare	Scattered	Scattered	Pervasive	Pervasive
23	23	Dense Graded	Open Graded	5	Part	Pervasive	Pervasive	Rare	Pervasive	Pervasive	Rare	Pervasive	Rare	Rare	Scattered
24	5	Dense Graded	Open Graded	5	Entire	Scattered	Not Seen It	Rare	Not Seen It	Scattered	Not Seen It	Scattered	Scattered	Not Seen It	Not Seen It
25	9	Dense Graded	Open Graded	5	Entire	Rare	Pervasive	Scattered	Pervasive	Scattered	Scattered	Scattered	Scattered	Pervasive	Rare
26	0	Dense Graded	Open Graded	7	Entire	Not Seen It	Not Seen It	Pervasive	Scattered	Don't Know	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Scattered
27	27	Dense Graded	Open Graded	7	Part	Pervasive	Scattered	Rare	Rare	Scattered	Rare	Rare	Rare	Scattered	Rare
28	16	Dense Graded	Open Graded	7	Entire	Scattered	Scattered	Pervasive	Pervasive	Scattered	Pervasive	Scattered	Pervasive	Scattered	Scattered
29	23	Dense Graded	Open Graded	7	Part	Scattered	Pervasive	Scattered	Pervasive	Not Seen It	Scattered	Scattered	Rare	Rare	Rare
30	11	Dense Graded	Open Graded	7	Part	Scattered	Not Seen It	Scattered	Rare	Rare	Scattered	Scattered	Scattered	Rare	Scattered
31	29	Dense Graded	Open Graded	7	Entire	Pervasive	Scattered	Scattered	Scattered	Scattered	Not Seen It	Rare	Rare	Scattered	Scattered
32	21	Dense Graded	Open Graded	7	Part	Pervasive	Scattered	Scattered	Pervasive	Not Seen It	Not Seen It	Scattered	Not Seen It	Not Seen It	Not Seen It
33	30	Dense Graded	Open Graded	7	Part	Pervasive	Pervasive	Pervasive	Pervasive	Rare	Pervasive	Pervasive	Pervasive	Scattered	Pervasive
34	4	Dense Graded	Open Graded	8	Entire	Scattered	Pervasive	Scattered	Rare	Scattered	Rare	Rare	Scattered	Scattered	Rare
35	16	Dense Graded	Open Graded	8	Part	Pervasive	Rare	Scattered	Scattered	Rare	Scattered	Rare	Rare	Scattered	Rare
36	10	Dense Graded	Open Graded	8	Part	Scattered	Pervasive	Pervasive	Scattered	Scattered	Scattered	Scattered	Scattered	Rare	Pervasive
37	23	Dense Graded	Open Graded	8	Entire	Pervasive	Scattered	Scattered	Scattered	Scattered	Not Seen It	Not Seen It	Scattered	Scattered	Scattered
38	13	Dense Graded	Open Graded	8	Entire	Scattered	Scattered	Not Seen It	Scattered	Pervasive	Scattered	Scattered	Scattered	Rare	Scattered
39	23	No Preference	Other	9	Part	Not Seen It	Not Seen It	No Answer	Scattered	Scattered	Not Seen It	Not Seen It	Not Seen It	Scattered	Scattered
40	0	Dense Graded	Open Graded	9	Part	Scattered	Not Seen It	Rare	Scattered	Scattered	Scattered	Rare	Scattered	Rare	Rare
41	20	Dense Graded	Open Graded	9	Entire	Rare	Not Seen It	Rare	Scattered	Scattered	Rare	Rare	Rare	Rare	Rare
42	26	Dense Graded	Open Graded	10	Entire	Pervasive	Not Seen It	Rare	Not Seen It	Pervasive	Rare	Not Seen It	Not Seen It	Not Seen It	Rare
43	25	No Preference	Open Graded	10	Part	Scattered	Rare	Not Seen It	Not Seen It	Pervasive	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Rare
44	26	Dense Graded	Open Graded	10	Part	Scattered	Not Seen It	Pervasive	Scattered	Pervasive	Pervasive	Rare	Scattered	Rare	Rare

RECORD #	YEARS	EASYTYPE	DIFFTYPE	DISTRICT	LOCATE Entire	STRESS1	STRESS2	STRESS3	STRESS4	STRESS5	STRESS6	STRESS7	STRESS8	STRESS9	STRESS10
45	12	Dense Graded	Open Graded	10	Entire	Rare	No Answer	Pervasive	Rare	Pervasive	Scattered	Scattered	Rare	Rare	Rare
46	11	Dense Graded	Open Graded	11	Part	Scattered	Pervasive	Rare	Scattered	Pervasive	Scattered	Pervasive	Rare	Rare	Pervasive
47	16	Dense Graded	Open Graded	11	Entire	Rare	Scattered	Pervasive	Not Seen It	Pervasive	Scattered	Scattered	Rare	Not Seen It	Scattered
48	17	Dense Graded	Don't Know	11	Part	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It
49	27	Dense Graded	Open Graded	11	Entire	Scattered	Scattered	Scattered	Rare	Pervasive	Rare	Scattered	Rare	Rare	Scattered
50	15	Dense Graded	Open Graded	12	Entire	Scattered	Rare	Pervasive	Pervasive	Pervasive	Rare	Scattered	Rare	Scattered	Rare
51	27	Dense Graded	Open Graded	12	Part	Scattered	Rare	Pervasive	Rare	Pervasive	Rare	Rare	Rare	Rare	Rare
52	15	Dense Graded	Open Graded	12	Part	Scattered	Not Seen It	Rare	Pervasive	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Pervasive	Not Seen It
53	31	Dense Graded	Open Graded	12	Part	Scattered	Pervasive	Pervasive	Rare	Rare	Scattered	Scattered	Scattered	Scattered	Rare
54	7	Dense Graded	Open Graded	12	Entire	Rare	Rare	Rare	Rare	Scattered	Rare	Rare	Rare	Rare	Scattered
55	4	Dense Graded	Other	12	Entire	Pervasive	Scattered	Rare	Not Seen It	Scattered	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It
56	13	Dense Graded	Open Graded	12	Part	Scattered	Not Seen It	Scattered	Pervasive	Scattered	Pervasive	Scattered	Scattered	Rare	Not Seen It
57	20	Dense Graded	Open Graded	13	Part	Rare	Rare	Rare	Pervasive	Rare	Rare	Rare	Rare	Scattered	Scattered
58	7	Dense Graded	Open Graded	13	Entire	Pervasive	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It
59	19	Dense Graded	Open Graded	14	Part	Pervasive	Not Seen It	Scattered	Pervasive	Pervasive	Rare	Scattered	Scattered	Not Seen It	Rare
60	20	No Preference	Other	14	Part	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer
61	16	Dense Graded	Open Graded	14	Entire	Rare	Pervasive	Scattered	Pervasive	Don't Know	Rare	Rare	Rare	Rare	Pervasive
62	23	Dense Graded	Open Graded	14	Part	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer
63	4	Dense Graded	Open Graded	2A	Entire	Scattered	Scattered	Pervasive	Scattered	Pervasive	Not Seen It	Not Seen It	Not Seen It	Pervasive	Not Seen It
64	30	Dense Graded	Open Graded	2A	Part	Scattered	Pervasive	Scattered	Rare	Rare	Rare	Scattered	Scattered	Scattered	Pervasive
65	12	Dense Graded	Open Graded	2A	Part	Rare	Scattered	Scattered	Scattered	Scattered	Rare	Not Seen It	Scattered	Rare	Pervasive
66	24	Dense Graded	Open Graded	2A	Part	Not Seen It	Pervasive	Scattered	Scattered	Pervasive	Rare	Not Seen It	Rare	Not Seen It	Rare
67	20	Dense Graded	Open Graded	2A	Part	Rare	Scattered	Pervasive	Scattered	Rare	Rare	Rare	Rare	Rare	Scattered
68	28	Dense Graded	Open Graded	2A	Entire	Rare	Rare	Scattered	Rare	Scattered	Rare	Rare	Rare	Rare	Rare
69	2	Dense Graded	Open Graded	2A	Entire	Rare	Rare	Scattered	Scattered	Scattered	Scattered	Rare	Scattered	Scattered	Scattered
70	20	Dense Graded	No Answer	2B	Part	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Rare	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It
71	29	Dense Graded	Open Graded	2B	Part	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know
72	25	Dense Graded	Open Graded	2B	Part	Rare	Scattered	Scattered	Rare	Rare	Scattered	Rare	Rare	Rare	Rare
73	28	Dense Graded	Open Graded	2C	Part	Scattered	Not Seen It	Scattered	Pervasive	Pervasive	Scattered	Scattered	Rare	Scattered	Rare
74	20	Dense Graded	Open Graded	2C	Part	Rare	Pervasive	Scattered	Pervasive	Pervasive	Rare	Pervasive	Scattered	Pervasive	Rare
75	21	Dense Graded	Open Graded	2C	Part	Scattered	Pervasive	Not Seen It	Scattered	Scattered	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Not Seen It
76	0	No Preference	Don't Know	2C	Entire	Not Seen It	Not Seen It	Not Seen It	Rare	Don't Know	Not Seen It	Not Seen It	Not Seen It	Don't Know	Not Seen It
77	18	Dense Graded	Open Graded	2C	Part	Pervasive	Scattered	Pervasive	Rare	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Pervasive	Not Seen It
78	0	Dense Graded	Open Graded	2C	Entire	Rare	Not Seen It	Scattered	Pervasive	Pervasive	Not Seen It	Not Seen It	Not Seen It	Not Seen It	Rare

RECORD #	STRESS11	STRESS12	STRESS13	STRESS14	STRESS15	STRSS15B	FOGSEAL	FOGPCT	FOGOFT	FOGLONG1	FOGLONG2	PREVEN2	QUANT1	QUANT2	QUANT3
1	Scattered	Rare	Scattered	Scattered	No	-	No	-	-	-	-	No	No	-	-
2	Not Seen It	Not Seen It	Scattered	Dont' Know	No	-	No	-	-	-	-	No	No	-	-
3	Scattered	Pervasive	Scattered	Pervasive	No	-	No	-	-	-	-	Yes	No	-	-
4	Rare	Rare	Scattered	Pervasive	No	-	Yes	1	10	No	No	No	No	-	-
5	Not Seen It	Rare	Scattered	Scattered	Yes	Rare	No	-	-	-	-	No	No	-	-
6	Pervasive	Not Seen It	Scattered	Scattered	No	-	No	-	-	-	-	No	Yes	Yes	No
7	Pervasive	Pervasive	Pervasive	Scattered	No	-	Yes	30	5	No	No	No	Yes	No	-
8	Scattered	Scattered	Scattered	Rare	Yes	Pervasive	Yes	1	Other	No	No	No	No	-	-
9	Scattered	Pervasive	Scattered	Scattered	Yes	Scattered	Yes	5	8	No	No	No	No	-	-
10	Pervasive	Don't Know	Scattered	Scattered	Yes	Scattered	No	-	-	-	-	No	No	-	-
11	Rare	Pervasive	Pervasive	Pervasive	No	-	No	-	-	-	-	No	Don't Know	-	-
12	Pervasive	Rare	Scattered	Rare	Yes	Pervasive	Yes	96	5	No	No	No	No	-	-
13	Pervasive	Scattered	Scattered	Not Seen It	Yes	Pervasive	No	-	-	-	-	No	No	-	-
14	Scattered	Scattered	Scattered	Pervasive	No	-	Yes	98	Other	Yes	No	No	Don't Know	-	-
15	Pervasive	Rare	Scattered	Rare	Yes	Scattered	Yes	15	Other	No	No	Yes	No	-	-
16	Scattered	Scattered	Scattered	Not Seen It	No	-	Yes	60	Other	No	No	No	Don't Know	-	-
17	Rare	Not Seen It	Scattered	Not Seen It	No	-	No	-	-	-	-	Yes	No	-	-
18	Pervasive	Scattered	Pervasive	Scattered	No	-	Yes	80	5	No	Yes	No	Don't Know	-	-
19	Pervasive	Scattered	Scattered	Scattered	Yes	Scattered	Yes	50	Other	No	Yes	No	Don't Know	-	-
20	Scattered	Rare	Not Seen It	Pervasive	Yes	Pervasive	No	-	-	-	-	No	No	-	-
21	Not Seen It	Don't Know	Scattered	Not Seen It	Yes	Pervasive	No	-	-	-	-	Yes	Don't Know	-	-
22	Pervasive	Pervasive	Scattered	Scattered	Yes	Pervasive	No	-	-	-	-	Yes	No	-	-
23	Scattered	Rare	Scattered	Scattered	Yes	Rare	Yes	40	10	No	No	No	Don't Know	-	-
24	Pervasive	Scattered	Scattered	Scattered	No	-	No	-	-	-	-	Yes	Don't Know	-	-
25	Pervasive	Rare	Rare	Rare	No	-	Yes	15	Other	No	No	Yes	No	-	-
26	Rare	Not Seen It	Scattered	Scattered	No	-	No	-	-	-	-	No	Yes	No	-
27	Scattered	Scattered	Scattered	Rare	No	-	Yes	5	Don't Know	No	No	Yes	No	-	-
28	Scattered	Pervasive	Scattered	Scattered	No	-	No	-	-	-	-	Yes	No	-	-
29	Rare	Not Seen It	Scattered	Scattered	No	-	No	-	-	-	-	Yes	No	-	-
30	Scattered	Rare	Scattered	Rare	No	-	No	-	-	-	-	Yes	No	-	-
31	Rare	Pervasive	Scattered	Rare	No	-	Yes	25	Don't Know	Yes	No	Yes	Don't Know	-	-
32	Not Seen It	Not Seen It	Scattered	Scattered	Yes	Scattered	Yes	10	Other	No	No	Yes	Yes	No	-
33	Scattered	Scattered	Pervasive	Pervasive	Yes	Pervasive	No	-	-	-	-	No	No	-	-
34	Scattered	Rare	Scattered	Rare	No	-	Yes	25	5	No	No	Yes	No	-	-
35	Rare	Rare	Rare	Rare	No	-	Yes	2	Other	No	No	No	No	-	-
36	Pervasive	Pervasive	Scattered	Rare	No	-	Yes	15	5	No	No	Yes	No	-	-
37	Scattered	Not Seen It	Pervasive	Not Seen It	Yes	Pervasive	Yes	5	Other	Yes	No	Yes	Yes	Yes	Yes
38	Rare	Rare	Scattered	Scattered	No	-	Yes	5	5	No	No	No	Don't Know	-	-
39	Pervasive	Pervasive	Scattered	Not Seen It	Yes	Pervasive	Yes	75	5	No	No	Yes	No	-	-
40	Scattered	Rare	Rare	Rare	No	-	No	-	-	-	-	Yes	No	-	-
41	Scattered	Scattered	Rare	Rare	No	-	Yes	70	5	No	No	Yes	No	-	-
42	Rare	Not Seen It	Not Seen It	Rare	No	-	Yes	20	7	No	No	Yes	Don't Know	-	-
43	Not Seen It	Rare	Scattered	Not Seen It	No	-	Yes	5	10	No	No	No	Yes	Yes	Yes
44	Scattered	Rare	Rare	Rare	Yes	Rare	Yes	95	5	Yes	No	No	No	-	-

RECORD #	STRESS11	STRESS12	STRESS13	STRESS14	STRESS15	STRSS15B	FOGSEAL	FOGPCT	FOGOFT	FOGLONG1	FOGLONG2	PREVEN2	QUANT1	QUANT2	QUANT3
45	Rare	Rare	Rare	Rare	No	-	No	-	-	-	-	Yes	No	-	-
46	Scattered	Rare	Scattered	Rare	No	-	No	-	-	-	-	No	No	-	-
47	Scattered	Not Seen It	Rare	Not Seen It	No	-	No	-	-	-	-	Yes	Don't Know	-	-
48	Not Seen It	Scattered	Not Seen It	Not Seen It	No	-	No	-	-	-	-	No	Yes	Yes	No
49	Pervasive	Rare	Scattered	Rare	No	-	Yes	25	7	No	No	No	No	-	-
50	Scattered	Rare	Scattered	Pervasive	No	-	Yes	50	5	No	No	No	No	-	-
51	Pervasive	Scattered	Rare	Pervasive	Yes	Pervasive	No	-	-	-	-	No	No	-	-
52	Not Seen It	Not Seen It	Pervasive	Not Seen It	No	-	No	-	-	-	-	Yes	No	-	-
53	Scattered	Scattered	Scattered	Scattered	No	-	No	-	-	-	-	Yes	No	-	-
54	Scattered	Scattered	Scattered	Rare	Yes	Scattered	Yes	50	6	No	No	Yes	No	-	-
55	Rare	Pervasive	Scattered	Pervasive	Yes	No Answer	Yes	25	5	No	No	No	No	-	-
56	Scattered	Scattered	Scattered	Scattered	Yes	Pervasive	No	-	-	-	-	Yes	Don't Know	-	-
57	Pervasive	Rare	Scattered	Rare	No	-	No	-	-	-	-	No	No	-	-
58	Not Seen It	Not Seen It	Not Seen It	Scattered	No	-	No	-	-	-	-	No	No	-	-
59	Pervasive	Pervasive	Scattered	Scattered	No	-	No	-	-	-	-	No	No	-	-
60	No Answer	No Answer	No Answer	No Answer	No Answer	-	No Answer	-	-	-	-	No Answer	No Answer	-	-
61	Pervasive	Rare	Rare	Not Seen It	No	-	No	-	-	-	-	No	No	-	-
62	No Answer	No Answer	No Answer	No Answer	No Answer	-	No Answer	-	-	-	-	No	No	-	-
63	Scattered	Scattered	Not Seen It	Not Seen It	Yes	Rare	Yes	15	2	No	No	No	Don't Know	-	-
64	Pervasive	Scattered	Scattered	Pervasive	No	-	No	-	-	-	-	No	No	-	-
65	Scattered	Pervasive	Not Seen It	Not Seen It	Yes	Rare	No	-	-	-	-	Yes	Don't Know	-	-
66	Pervasive	Not Seen It	Rare	Not Seen It	No	-	No	-	-	-	-	Yes	No	-	-
67	Rare	Scattered	Rare	Rare	Yes	Scattered	No	-	-	-	-	No	Don't Know	-	-
68	Rare	Rare	Rare	Rare	No	-	No	-	-	-	-	Yes	Yes	Yes	Don't Know
69	Scattered	Rare	Scattered	Rare	Yes	Rare	No	-	-	-	-	No	Don't Know	-	-
70	Rare	Not Seen It	Not Seen It	Not Seen It	No	-	No	-	-	-	-	No	Don't Know	-	-
71	Don't Know	Don't Know	Don't Know	Dont' Know	No	-	No	-	-	-	-	No	Don't Know	-	-
72	Scattered	Rare	Scattered	Rare	No	-	No	-	-	-	-	No	No	-	-
73	Scattered	Not Seen It	Scattered	Not Seen It	No	-	Yes	95	5	No	No	No	No	-	-
74	Pervasive	Pervasive	Scattered	Scattered	No	-	Yes	80	12	No	Yes	Yes	Don't Know	-	-
75	Pervasive	Not Seen It	Not Seen It	Not Seen It	No	-	No	-	-	-	-	Yes	Yes	Yes	Yes
76	Scattered	Not Seen It	Not Seen It	Not Seen It	No	-	No	-	-	-	-	No	Don't Know	-	-
77	Pervasive	Pervasive	Scattered	Pervasive	Yes	Pervasive	No	-	-	-	-	No	No	-	-
78	Rare	Rare	Scattered	Scattered	No	-	No	-	-	-	-	No	Don't Know	-	-

RECORD #	SUCC1	SUCC2	SUCC3	SUCC4	SUCC5	SUCC6	SUCC7	SUCC8	SUCC9
1	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used
2	Somewhat Successful	Not Very Successful	Somewhat Successful	Not Very Successful	Completely Successful	Completely Successful	Not Very Successful	It Depends	It Depends
3	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Somewhat Successful	Have Not Used	Not At All Successful	Have Not Used
4	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Completely Successful	Completely Successful	Have Not Used	Somewhat Successful	Have Not Used
5	Have Not Used	Somewhat Successful	Somewhat Successful	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Completely Successful	Have Not Used
6	It Depends	Somewhat Successful	Somewhat Successful	Somewhat Successful	Hace Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used
7	Completely Successful	Somewhat Successful	Completely Successful	Somewhat Successful	Completely Successful	Completely Successful	Somewhat Successful	Completely Successful	Somewhat Successful
8	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Not At All Successful	Not At All Successful	Not At All Successful
9	Somewhat Successful	Somewhat Successful	Somewhat Successful	Not Very Successful	Somewhat Successful	Somewhat Successful	Not Very Successful	Somewhat Successful	Somewhat Successful
10	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used
11	Somewhat Successful	Completely Successful	Somewhat Successful	Somewhat Successful	Completely Successful	Completely Successful	Have Not Used	Completely Successful	Have Not Used
12	Completely Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Completely Successful	Completely Successful	Have Not Used	Somewhat Successful	Have Not Used
13	Not Very Successful	Not Very Successful	Somewhat Successful	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Not Very Successful	Have Not Used
14	Somewhat Successful	Somewhat Successful	Completely Successful	Have Not Used	Completely Successful	Completely Successful	Have Not Used	It Depends	Have Not Used
15	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Hace Not Used	Completely Successful	Have Not Used	It Depends	Have Not Used
16	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Completely Successful	Completely Successful	Have Not Used	Have Not Used	Completely Successful
17	Have Not Used	Not Very Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used
18	Have Not Used	Not At All Successful	Completely Successful	Somewhat Successful	Hace Not Used	Completely Successful	Have Not Used	Somewhat Successful	Somewhat Successful
19	Somewhat Successful	Completely Successful	Completely Successful	Completely Successful	Hace Not Used	Completely Successful	Have Not Used	Completely Successful	Have Not Used
20	Have Not Used	Have Not Used	Completely Successful	Have Not Used	Hace Not Used	Completely Successful	Have Not Used	Completely Successful	Have Not Used
21	Have Not Used	Have Not Used	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know
22	Have Not Used	Somewhat Successful	Somewhat Successful	Completely Successful	Hace Not Used	Have Not Used	Have Not Used	It Depends	Have Not Used
23	Somewhat Successful	Somewhat Successful	Completely Successful	Somewhat Successful	Hace Not Used	Completely Successful	Have Not Used	Somewhat Successful	Have Not Used
24	Somewhat Successful	Have Not Used	Somewhat Successful	Don't Know	Somewhat Successful	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used
25	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Somewhat Successful	Have Not Used	Somewhat Successful	Not Very Successful
26	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used
27	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used
28	Somewhat Successful	Somewhat Successful	Not Very Successful	Somewhat Successful	Completely Successful	Somewhat Successful	Somewhat Successful	Completely Successful	Somewhat Successful
29	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Somewhat Successful	Completely Successful
30	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Somewhat Successful	Completely Successful
31	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Completely Successful	Somewhat Successful
32	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used
33	Somewhat Successful	Not Very Successful	Have Not Used	Have Not Used	Completely Successful	Completely Successful	Have Not Used	Completely Successful	Have Not Used
34	Somewhat Successful	Somewhat Successful	Somewhat Successful	Completely Successful	Completely Successful	Have Not Used	Somewhat Successful	Have Not Used	Somewhat Successful
35	Somewhat Successful	Somewhat Successful	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Completely Successful	Completely Successful
36	Have Not Used	Have Not Used	It Depends	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	It Depends	Completely Successful
37	Not At All Successful	Not At All Successful	Not At All Successful	Not At All Successful	Not At All Successful	Not At All Successful	Not At All Successful	Not At All Successful	Completely Successful
38	Somewhat Successful	Somewhat Successful	Completely Successful	Completely Successful	Completely Successful	Completely Successful	Have Not Used	Completely Successful	Have Not Used
39	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Not Very Successful	It Depends
40	Somewhat Successful	Somewhat Successful	Somewhat Successful	Not Very Successful	Completely Successful	Completely Successful	Have Not Used	Completely Successful	Have Not Used
41	Somewhat Successful	Somewhat Successful	Not Very Successful	Not Very Successful	Somewhat Successful	Somewhat Successful	Not Very Successful	Not Very Successful	Somewhat Successful
42	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Completely Successful	Completely Successful
43	Completely Successful	Completely Successful	Completely Successful	Completely Successful	Hace Not Used	Completely Successful	Have Not Used	Somewhat Successful	Completely Successful
44	Completely Successful	Completely Successful	Completely Successful	Completely Successful	Completely Successful	Completely Successful	Have Not Used	Somewhat Successful	Completely Successful

RECORD #	SUCC1	SUCC2	SUCC3	SUCC4	SUCC5	SUCC6	SUCC7	SUCC8	SUCC9
45	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used	Hace Not Used	Completely Successful	Have Not Used	Completely Successful	Have Not Used
46	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Completely Successful	Completely Successful	Have Not Used	Somewhat Successful	Have Not Used
47	Completely Successful	Completely Successful	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Completely Successful	Have Not Used
48	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used
49	Somewhat Successful	Have Not Used	Completely Successful	Somewhat Successful	Completely Successful	Completely Successful	Have Not Used	Completely Successful	Have Not Used
50	Somewhat Successful	Have Not Used	Somewhat Successful	Not Very Successful	Not Very Successful	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used
51	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used	Hace Not Used	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used
52	Completely Successful	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used
53	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Not Very Successful	Somewhat Successful	Have Not Used	Completely Successful	Have Not Used
54	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used
55	Have Not Used	Have Not Used	Completely Successful	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used
56	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used
57	Completely Successful	Not Very Successful	Somewhat Successful	Not At All Successful	Hace Not Used	Have Not Used	Have Not Used	Completely Successful	Have Not Used
58	Completely Successful	Completely Successful	Somewhat Successful	Somewhat Successful	Completely Successful	Completely Successful	Have Not Used	Completely Successful	Have Not Used
59	Somewhat Successful	Have Not Used	Completely Successful	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used
60	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer
61	Somewhat Successful	Have Not Used	Not Very Successful	Have Not Used	Not Very Successful	Not Very Successful	Have Not Used	Have Not Used	Not Very Successful
62	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used
63	Somewhat Successful	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Completely Successful	Have Not Used
64	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used
65	Have Not Used	Have Not Used	It Depends	It Depends	Somewhat Successful	Somewhat Successful	Have Not Used	Completely Successful	Completely Successful
66	Not Very Successful	Somewhat Successful	Not Very Successful	Not Very Successful	Somewhat Successful	Completely Successful	Completely Successful	Somewhat Successful	Not Very Successful
67	Completely Successful	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	Have Not Used
68	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Completely Successful	Have Not Used	Somewhat Successful	Completely Successful
69	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used
70	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used
71	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used
72	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Hace Not Used	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used
73	Not At All Successful	Not Very Successful	Not At All Successful	Not At All Successful	Somewhat Successful	Completely Successful	Completely Successful	Completely Successful	Completely Successful
74	Somewhat Successful	Not Very Successful	Have Not Used	Have Not Used	Hace Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used
75	Completely Successful	Completely Successful	Have Not Used	Have Not Used	Completely Successful	Completely Successful	Have Not Used	Have Not Used	Have Not Used
76	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Don't Know	Completely Successful	Have Not Used
77	Completely Successful	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Completely Successful	Have Not Used	Somewhat Successful	Have Not Used
78	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Hace Not Used	Completely Successful	Have Not Used	Have Not Used	Completely Successful

RECORD #	SUCC10	SUCC11	SUCC12	SUCC13	SUCC14	SUCC15	SUCC16	SUCC17	SUCC17B
1	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not At All Successful	Have Not Used	No	-
2	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Somewhat Successful	No	-
3	Not At All Successful	It Depends	Have Not Used	Have Not Used	Not At All Successful	Not Very Successful	Not At All Successful	No	-
4	Not At All Successful	Have Not Used	Have Not Used	Not Very Successful	Completely Successful	Somewhat Successful	Not Very Successful	No	-
5	Not Very Successful	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Have Not Used	No	-
6	Somewhat Successful	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Not Very Successful	Have Not Used	Yes	Somewhat Successful
7	Have Not Used	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	No	-
8	Not At All Successful	Not Very Successful	Not Very Successful	Not Very Successful	Not Very Successful	Not Very Successful	Not Very Successful	No	-
9	Not At All Successful	Not Very Successful	Somewhat Successful	Somewhat Successful	Not Very Successful	Not Very Successful	Not Very Successful	No	-
10	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Somewhat Successful	Have Not Used	No	-
11	Have Not Used	Not At All Successful	Have Not Used	Somewhat Successful	Completely Successful	Not Very Successful	Have Not Used	Yes	Somewhat Successful
12	Have Not Used	Completely Successful	Have Not Used	Completely Successful	Completely Successful	Somewhat Successful	Have Not Used	No	-
13	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used	No	-
14	Have Not Used	Completely Successful	Not Very Successful	Not At All Successful	Have Not Used	Somewhat Successful	Somewhat Successful	No	-
15	Have Not Used	Have Not Used	Not Very Successful	Have Not Used	Not Very Successful	Not Very Successful	Have Not Used	No	-
16	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not At All Successful	Have Not Used	No	-
17	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Not Very Successful	Somewhat Successful	Somewhat Successful	No	-
18	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Yes	Somewhat Successful
19	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used	No	-
20	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	No	-
21	Don't Know	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Not Very Successful	Somewhat Successful	Yes	Somewhat Successful
22	Not At All Successful	Not At All Successful	Not At All Successful	Not Very Successful	Have Not Used	Not At All Successful	Not At All Successful	No	-
23	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Have Not Used	No	-
24	Don't Know	Somewhat Successful	Not At All Successful	Not Very Successful	Somewhat Successful	Somewhat Successful	Not Very Successful	No	-
25	Have Not Used	Somewhat Successful	Not Very Successful	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	No	-
26	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Have Not Used	Yes	Somewhat Successful
27	Have Not Used	Somewhat Successful	Have Not Used	Completely Successful	Somewhat Successful	Not Very Successful	Somewhat Successful	No	-
28	Have Not Used	Completely Successful	Have Not Used	Somewhat Successful	Completely Successful	Not Very Successful	Not Very Successful	Yes	Not Very Successful
29	Have Not Used	Somewhat Successful	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Have Not Used	No	-
30	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	No	-
31	Somewhat Successful	Completely Successful	Completely Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	No	-
32	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	No	-
33	Not At All Successful	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Not Very Successful	Have Not Used	No	-
34	Have Not Used	Somewhat Successful	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	No	-
35	Somewhat Successful	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	No	-
36	Have Not Used	Have Not Used	Have Not Used	Don't Know	Have Not Used	Completely Successful	Have Not Used	No	-
37	Have Not Used	Completely Successful	Completely Successful	Completely Successful	Not At All Successful	Not Very Successful	Have Not Used	No	-
38	Have Not Used	Not Very Successful	Have Not Used	Completely Successful	Completely Successful	Not At All Successful	Have Not Used	No	-
39	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Have Not Used	No	-
40	Have Not Used	Somewhat Successful	Somewhat Successful	Not At All Successful	Have Not Used	Somewhat Successful	Somewhat Successful	No	-
41	Have Not Used	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	No	-
42	Not At All Successful	Somewhat Successful	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	Not At All Successful	No	-
43	Not Very Successful	Completely Successful	Have Not Used	Completely Successful	Somewhat Successful	Somewhat Successful	Somewhat Successful	No	-
44	Not At All Successful	Completely Successful	Have Not Used	Completely Successful	Have Not Used	Somewhat Successful	Not Very Successful	No	-

RECORD #	SUCC10	SUCC11	SUCC12	SUCC13	SUCC14	SUCC15	SUCC16	SUCC17	SUCC17B
45	Have Not Used	Completely Successful	Have Not Used	Completely Successful	Have Not Used	Somewhat Successful	Have Not Used	No	-
46	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Completely Successful	Have Not Used	No	-
47	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	Somewhat Successful	Have Not Used	No	-
48	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	No	-
49	Have Not Used	Completely Successful	Completely Successful	Somewhat Successful	Not At All Successful	Somewhat Successful	Completely Successful	No	-
50	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	No	-
51	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Not Very Successful	Have Not Used	No	-
52	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	No	-
53	Completely Successful	Completely Successful	Completely Successful	Completely Successful	Have Not Used	Somewhat Successful	Completely Successful	No	-
54	Have Not Used	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	No	-
55	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	Yes	Completely Successful
56	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Have Not Used	Not Very Successful	Have Not Used	No	-
57	Not Very Successful	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	No	-
58	Have Not Used	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Have Not Used	No	-
59	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Completely Successful	No	-
60	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	No Answer	-
61	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Have Not Used	Have Not Used	No	-
62	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	No	-
63	Not Very Successful	Not Very Successful	Not Very Successful	Not Very Successful	Not Very Successful	Not Very Successful	Somewhat Successful	No	-
64	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not Very Successful	Have Not Used	No	-
65	Somewhat Successful	Not At All Successful	Not At All Successful	Somewhat Successful	Completely Successful	Completely Successful	Somewhat Successful	No	-
66	Have Not Used	Have Not Used	Have Not Used	Completely Successful	Completely Successful	Not Very Successful	Somewhat Successful	No	-
67	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	No	-
68	Completely Successful	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Have Not Used	No	-
69	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	No	-
70	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	No	-
71	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Yes	Completely Successful
72	Have Not Used	Have Not Used	Have Not Used	Somewhat Successful	Somewhat Successful	Somewhat Successful	Have Not Used	No	-
73	Somewhat Successful	Have Not Used	Have Not Used	Have Not Used	Completely Successful	Not Very Successful	Have Not Used	No	-
74	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Not At All Successful	Have Not Used	No	-
75	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Have Not Used	Completely Successful	Have Not Used	No	-
76	Have Not Used	Have Not Used	Have Not Used	Completely Successful	Have Not Used	Somewhat Successful	Have Not Used	Yes	Somewhat Successful
77	Have Not Used	Have Not Used	Have Not Used	Don't Know	Have Not Used	Not Very Successful	Somewhat Successful	No	-
78	Have Not Used	Have Not Used	Have Not Used	Have Not Used	It Depends	Not Very Successful	Have Not Used	No	-

APPENDIX C– RESPONSES TO OPEN-ENDED QUESTIONS, 2001 MAINTENANCE SUPERVISOR SURVEY

A
DEVELOPMENT OF MAINTENANCE PRACTICES FOR F-MIX ASPHALT

AUGUST, 2001

NARRATIVE ANSWERS TO OPEN-ENDED QUESTIONS

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Note: These answers have been recorded verbatim. They have been corrected for spelling but not for grammar.

EASYWHY: Why is that asphalt easier to maintain?

Because dense graded easier to maintain...to snow plow. We are in the mountain section to maintain.

Because it's easier to get the mix from the asphalt plant. As a crew, we really haven't put any F mix down, so when we go to repair it, we have to use a different mix, and that doesn't really go down well.

Because when dense graded asphalt develops alligator cracking, we can go out and patch it with either cold mix or hot mix. If you do that on open graded, you create a dam which forces water to go around the dam. It dams up the drainage, which is supposed to run under the mix, so if you put that patch on it, it builds up and gradually goes around it, and the water build up around it and it stays wet for days and days. Then if it freezes you end up with an icy spot.

Because you can always creed patches or you can pave on top of it without changing the integrity of it.

Because you can chip seal it or you can pave it or you can grind it out and repave it, it's just easier to maintain.

Dense, open grade nothing sticks to it; rocks real porous. Dense holds good asphalt patch over it not come up.

Doesn't require being cold planed.

Each have characteristics open graded mix has more of a tendency to be forgiving in cold weather, but in hot weather we can't do routine maintenance, it damages the pavement. Ours is a cold mix, an EAC.

Easier to patch.

Easier to patch and the material available is C-mix or dense mix.

Easier to patch, easier to pave.

Easier to work... Can patch shallow the hole with it...if you know technology of using F mix. People don't know what to do with it.

Easy to lay down; easy to match with existing mixes.

F-mix is messy, temperature sensitive, cannot feather.

For plowing, maintenance.

For us it's what the rest of our asphalt is and easier to replace if you grind it out.

Holds patch work better; easier to repair with crack sealing, cold or hot mix patches.

I am familiar with it; patching is easy with no conflicting problems.

I don't have any preference...it has to do with the type of material I used. Cold mix in asphalt.
I don't work with it ...it doesn't apply.
I work on bridges for 28 years I don't do a lot of asphalt.
It is what we use mostly...our equipment's work with dense mix not open graded mix. When you have something go wrong you can fix it easily.
It causes a better seal on the highways; most of my experience has been east of the Cascades where there is a lot of freeze/thaw and the open graded doesn't allow extended drainage.
It compacts easier; stays longer; does not have so many bones to rake around.
It depends ... You put the open graded in the areas where you need the flexibility and drainage, and the dense in areas like mountain passes, on inclines, in the shade. You just got to pick the location; one shoe doesn't fit everybody, which is what they try to do.
It doesn't fall apart.
It doesn't seem to absorb - F-mix does not seem to absorb de-icers and had rutting problems.
It handles easier as far as when you are doing a thin lift maintenance you use a lot of D-mix for filling in rutting - going with a finer grade mix you are able to feather it out and get a smoother transition.
It is easier for patching ...you don't need to associate with the drainage.
It is easier to work...rock is smaller you don't have problem at the end.
It is easier we can put much depth to be able to utilize it.
It is readily available, can get it at any plant. Doesn't take any special equipment to put it down, other than normal. Also-mix, is really hard to pot hole patch, you can't just buy a little bit. Not readily available. Real pain in the rear, hard to repair, hard on equipment.
It just seems to go down easier and easier to rake and feather.
It last longer for one thing, and the repairs are generally not as extensive because the damage is less extensive.
It's a well graded material and you can seal up the hole and get it to bind better.
It's because you get better water runoff.
It's easier to get in small quantities.
It's easier to patch.
It's easier to patch and holds up better to steel bit plows.
It's easier to repair and maintain.
It's easier to repair and when do small patch it forms better and also open graded asphalt, it's not available.
It's hotter, smaller, goes down easier.
It's repairable; much easier to rake in; rolls better; more user friendly and it's available.
Just because its, I don't know how to phrase this, its easier to maintain, the techniques are easier because you don't have to worry about the drainage issues you do with open graded.
Just easier for us to maintain.
Just easier to patch.
Just easier to work with and maintain.
Just it's just a smaller grade and you can move it, it not fluid, but its more workable than the larger grade.
More available; less permious to the water; appears to last longer.
More easily obtainable and you can get it any place the type of the repairs that we do (machine) is the key.
More readily available.

Most of the maintenance work that we do has been blade patch and when you use a dense grade you can feather and better control the material.

Much easier to patch and feather; tends to take your anti and de icers much better; doesn't have the water buildup that forms ice.

Not real clear on the maintenance of F-mix.

Only because you can tell what it's doing - easier to do preventative maintenance.

Open graded seems to have an issue with the carbide steel bits, snow plow and road grader bits when they are used on snow and ice in the wintertime. It doesn't seem that it holds up as well to heavy truck traffic.

Several reasons when it gets to F mix... To repair when the water start raveling out start to do the patching. It's hard to get to re-bond the new asphalt to the F-mix. It doesn't bond well...end up putting more asphalt on than you normally would.

The availability to fix the product - we don't know if we can alter the F-mix.

The cold mixes are actually easiest to maintain, the hot mixes require crack sealing and we've had some f mix failed, and started to ravel out.

The patching is easier; easier to lay; availability is there.

The reason I say that is the compatibility is that c-mix is what we use for patching, especially in the wintertime. And c-mix seems to be more compatible with dense mix. And the availability is for the most part; our asphalt plants in the local area have dense mix, and workability.

The workability of the material you fix it with; you can patch without creating a barrier for the water to migrate to the shoulder; materials more readily available.

Um..for one reason it's readily available in our area. It's hard to find F-mix after it's been put out.

Um..it is more readily available..and it's not sensitive to the sub-grade drainage. I haven't had lots of experienced with open graded as far as maintenance repair.

Um..one-it's hard to get consistency to patch it. The dense graded you don't have problem with..it's a lot more expensive.

Usually, when there is an accident and the road gets tore up, it seems the dense graded doesn't get as torn up as the open graded.

We are more familiar with it; easier to use, rake, feather.

We have not attempted to repair f mix; we have it in about four places and have not yet worked on it. So dense graded is what we have experience with.

Well for one thing, with open graded mix, the water will stand in the open graded and not run away so it ices over. It takes a lot more sand to keep it sanded. And in regard to easy to maintain, if you want to patch it, you can only get f-mix in certain amounts and if you patch it with another grade of mix most of our patching is in winter and the only mix available is dense mix and it requires a lot more patch coat because there is more surface exposed. Also it only works when the surface is hot, so it really needs to be patched in the summer. Also ravelling is one of the common problems with it. I've said if they wanted to put it in again, it would be over my dead body. Also we have steel bladed plows out here and that is really hard on F-mix.

Well it's a smaller rock and it's easier to handle in the equipment that we have, it's easier to rake, and it's easier to shovel. It's just easier all around to manage.

Well right now we are more familiar with it - we have always dealt with it - we don't have a resource for the material for open graded.

Well..what happens in snow zone..the plow push.. ...over the long run the road washboard..so you end up with a rough road over time ..small rocks come loose from pavement. The gravels come to the

road and it's dangerous. (P) Open graded has more maintenance problems... Dense graded doesn't have problems.

When we do our patching we put on D-mix or C-mix.

When we have to patch this stuff, we have to patch with the dense cause we don't have the equipment (blade or whatever) to patch with the F-mix.

You are able to repair it a lot easier; better finish with a grader and by hand.

You can work dense - rake it around.

You don't get the water and the contamination that you get in the F-mix the dense graded, all the water and stuff will run off.

You get a pothole and repair it with dense graded mix.

DIFFWHY: Why is that asphalt difficult to maintain?

A common patch like crack sealing seems to trap the water; the f-mix does not stick to deck.

Actually I have seen the brand new project last only 4 months ..try to keep it together for winter..we did the pot holing. We re-graded with the dense graded. They didn't have a problem after that. The open graded didn't survive at freeze-thaw, when snow and ice will drain to it. At sunset it tears apart.

Again, the aggregate size when you go to make a repair on it, when you go to make it smooth, so aggregate size.

All you've got to work with (as far as maintenance) is dense graded - no patching material.

Availability - you can't buy it or match to it; once you have started repairing f-mix you have ruined it - you cannot match it with another open graded mix.

Basically the opposite of the first. Our equipment will handle it, but it really isn't really set up for it. Also it is harder to rake and get a satisfactory finish to it.

Basically, getting the product in small amounts when needed and trying to place it in small amounts without grading. We can fill much easier with dense mix than with open mix because you need a much deeper hole to use the f-mix. The patched area needs to be significantly deeper with an open mix as compared to dense mix. Also the rocks are more easily flipped out because there are no finer rocks to hold it there.

Because I have a limited budget and I can't afford to replace all of it, I can just replace part of it. It was not installed properly. Our maintenance is not just repairing the highway, it includes keeping it safe. In the winter it doesn't drain like it is supposed it holds water and then it freezes. In the area where I have my biggest problems it is an f-mix inlay and it was ground down 4 inches and put back 2, only down to the fogline. So maintenance had to grind the last foot or two, which left a little bathtub so to speak inside the c-mix that was left. I don't see us making that mistake any longer, but that is what I've been left with.

Because it is harder to set in the joint. Open graded mix, the perception we created the dam. That's not good.

Because of the freeze and thaw.

Because we don't really know how to maintain it.

Because you have pretty much to grind it out and put it in. In dense-mix you put it right over.

Cannot do a thin patch overlay and it entails grinding (time consuming and expensive (30-40% more); defeats the purpose of drainage by plugging it with c or b-mix; cools off quicker; water may come up somewhere else completely different.

Cannot find the material to patch; harder to cut out with our equipment.

Can't find it; more expensive because it's not available; takes more thought and planning from maintenance.

Difficult to patch; in the winter time the temperature extremes cause the moisture to freeze and it pops the rocks loose.

Does not get compaction because it is too open; it does not stay; it ices up easier; the recommended fog-seal is not budgeted for and this takes about 50% of the life away.

During the winter, the car tire studs pick out the larger rocks and rub the road much faster then the dens graded material.

For one, it plugs up and it ravels a lot easier. It doesn't seem to wear as well either. You can't patch it.

Have no experience applying it and little experience with maintaining it.

I don't know. It doesn't apply for me.

I don't really work with open graded.

I don't work on asphalt as much.

If you try to fix it, it is harder to fix. The aggregate structure is loose. You don't have structure integrity for it. Even if you repair it, it continues to fail.

It is almost impossible to rake or shovel because of the oil.

It seems like it breaks down faster and also the washboard condition on it from snow plowing.

It's a little more of a challenge to make repairs to; drainage concerns.

It's difficult to find the material and it's very difficult to work with - you can't feather out the asphalt to get a smooth ride.

It's difficult to patch due to drainage problem. ..difficult to buy small quantity of f-mix open graded.

It's difficult to plug; you cannot widen it (difficult to put the safety improvements down); limits access to utilities.

It's hard to get in small quantities.

Its just about impossible to repair a patch with like material and anytime you try to patch it with a dense material they have dissimilar properties and they don't match up. And when you do this you cancel out the one great advantage of the open material which is water drainage. It actually traps the water at the patch and doesn't allow it to migrate out to the fog line. Whatever water is on the road tends to stop at the patch line.

Its just I'd say, the patches are harder to place and by patching it degrades the purpose of the open graded mix.

Its more of an experimental thing that we are doing, finding out what works and what doesn't, and also you have to be concerned about water being able to move through the mixture.

It's not as hot and really hard to spread out with the grader we use - you can't do patching with the larger gravel.

Just because we don't get open graded from vendor to repair. It's not available. It's harder to work when doing repair patching.

Just can't get small amount to patch it. Really big aggregate in it- hard to do a thin lip with one inch rock.. It requires maintenance sooner in the mountain pass areas.

Just the smaller patches that we do, you can't get the open graded in quantities to make those patches so you have to use the dense graded to make those patches and that causes problems.

Just when it comes to repair ..it has to be cold planed out.
Large stone matrix and there are no fines, so no blending or raking.
Lets get some definitions down here- are we just talking about f-mix? Our f-mix is only 10 years old, and we were recommended to fog coat it every four to five years, so we really haven't had that much experience maintaining it. If you were to go to replace in kind, f mix with f mix, it's definitely harder to work with.
Let's the water run on, but does not let it run all the way down; forms ice flows in the winter.
No fines make it difficult to rake.
Not available at times or at all, by location.
On spills, where vehicles lose fluids, it's harder to clean up on an open-graded mix.
Our machinery does not work with f-mix (the nature of the oils globs up and it just rolls underneath it). Difficult for us to get it (the plants do not want to order the special oils). The nature of an open grade mix holds moisture a lot longer and the weather needs to be warm and dry in order for the asphalt to hold - delamination problems within a year.
Part of the reason the open graded is difficult to maintain is that there is no effective way to patch the highway without destroying why we have an open graded mix in the first place, which is to have less spray. So when we go out and patch a large area, we are building a large dam. There is no effective way to patch it with the equipment we have now.
Plug patching creates a dam for water flowing in it.
Repairing with a dense graded mix creates a dam; cannot get in to stick in small quantities (for heat reasons and compaction); cannot get it to feather.
Same as before, each have their characteristics.
Since we've never attempted working on it, I don't know how to answer that. Dense is what we've worked with.
The drainage is worse over the years; it's harder to patch and I have used all the mixes and cannot get the consistency of the f-mix when it's first put down.
The graders do not work with the f-mix - it just does not lay down well as you have to move the material around and this results in losing the adhesive qualities.
The most difficult to work with is f-mix because we can't access it from our supplier. Not having it. It's not common in the market. They don't commonly make it. They make c-mix, d-mix like that. It can't be settle down. You have to lay in full depth. We end up using c mix.
The oils have a tendency to settle and the compaction is a little different than we are used to (especially if patching on an existing overlay). When we have accidents with liquid spills the f-mix holds the liquids and this sits in the cement.
The size of the rock and then there are no fines in it - you have to grind and inlay and we don't have a grinder to use - ours only has an 18" grinder.
Too difficult to patch.
Um not sure how to phrase that. When the f mixes work they're fine, but when they fail, they have to be replaced. You can't really maintain them.
Um..it's hard to find replacement material... I never put down f-mix as a maintenance repair.
Um..same reasons, when it start raveling out it goes, almost all of it goes .
Um..you can't use open graded to patch with unless you had contract, you've got to patch, you've got to use something else. Open graded seems not to have acceptability to rut.
Usually open graded mix, when you get a pothole, it seems to blow out quicker and you've got more to repair. And also when you go to repair open graded, the supplier doesn't supply us with an open

graded mix, so we have to repair it with dense graded. Most of the roads I work on, now we use cold mix.

We are on maintenance and you cannot just put a f-mix patch on - it's gooey and hard to move.

We can't find any type of material to match it.

We can't repair open graded to the same as it was originally. You can't buy it ...there is a special stuff.. They don't run open graded on the daily basis.

We do not have the source of material to patch holes - the dense material complicates things by clogging the space and prevents water from draining - traps water and sheets of ice form in winter.

We don't have the f-mix available during patching time - don't produce in small quantities.

We get pockets of ice with the freeze and thaw; it's harder to patch and maintain.

Well, because the open grade mix, they serve a purpose, they move water, but on the maintenance side, when a diesel truck spills over, the diesel goes into the mix. So that’s my main problem with it is that it captures all the petroleum products and then when we get our first rains, it brings all that oil up to the surface and that causes concerns.

Well, because you can't, its hard to plug patch.

Well, it's like I said, we can't get the mix from the plant, it's just that we have to get a different mix to fix it with.

Well, because it is not readily available. I haven't had a lot of experience with it.

Well, if you have a problem with open graded ..they aren't set up to do the small quantity...it's expensive. Harder to work with . The other problem is if you don't go at least 2 inches thick it doesn't seem to bind to it so you get pot-holes on the road.

When patching the open graded, it clogs. When you grind out an inlay you create an oil barrier which does not allow the water to drain.

You are not going to be able to work it like a normal dense mix; then you get into the issue of availability - when we are doing repair work on a small scale, they do not have small quantities available.

You can't patch with a blade (it's too sticky)- you need a machine. There is no tension strength, you have to grind it out, which is time consuming and expensive to do it right.

You can't rake in the dips and the availability of f-mix is difficult - they don't make smaller quantities.

You have to hire a contractor who specializes in working with f-mix who can grind it out and match it (extremely hard to lay a patch with the existing f-mix & you don't want to use b or c mix because the water pools).

LOCATE2: What area in the District does your maintenance work cover?

All Linn County.
Central and northern Jackson & south-eastern corner of Douglas counties.
Clatskanie section, district 2a.
Corvallis and Sweet Home.
Detroit and Santiam Pass - 2203 & 2206.
East Portland.
East side of district. Lake County.
Eastern part and Willamette Highway.
Estacada - everything from Highway 224 & 212 junction; Highway 211.
Florence on the beach ... On the west side of the district.
Grants Pass maintenance area.
Greater Linn County.
Heppner and Spray.
Highway 26 from milepost 5.6 - milepost 42.25, the Mt. Hood Highway.
I-84 from Troutdale to Hood River.
I'm in D9 east, Arlington Condon and Moro.
I'm in the Ashland section, Crew 3303.
In charge of maintenance in Sisters, Bend and Brothers.
It's called Baldock maintenance section.
Just the 2306 area, which is the coast area.
Lake of the Woods, Klamath and Chiloquin sections.
LaPine, Chemult, Silver Lake.
Manning section.
McMinnville/Newburg area.
Mile point to 42 on highway 26, the Mt. Hood highway, down mile point 102, Hood River, Zigzag Junction Route 35 and Highway 26 to point 62, , Highway 26/Route 53, Highway 281 and Highway 282, Timberline Road , Highway 173.
Mile post 216 to 252 on I-84.
North-west corner of the district.
Part of Lane County.
Pendleton, Pilot Rock, Milton-Freewater - 550 lane miles total.
South coast.
South Douglas County area.
Southeast Portland ..the greater SE area.
Sylvan section.
The Coquille, Coos Bay area.
The north 2/3 of Baker County.
The north Portland section - I-5 between Marquam and Interstate bridges; Highway 30 between I-405 and Scapoose; Lombard Street (Highway 30 bypass)from St. Johns to 60th Avenue, NE; Martin Luther King Boulevard from Burnside Street to Marine Drive.
The Salem, Woodburn area.
The southern part.
The Vale and Ontario sections.
The Veneta section.

The west part, district 14 west.
The west side of district 12.
The western half.
Walterville (mile post 13 to 77); Belknap highwy (from mile post 20 to 13).
We are 101 from mile post 46 to mile post 91 and Highway 6 from 0 to 27.8; Highway 131 from 0 to 8; little Nestucca Highway (130) from 0 to 10; Highway 22 from 0 to 11.
Well, we cover from milepost 209 to 168 on the Interstate; we go up on Highway 126 to milepost 13, go up Highway 58 to milepost 6; all of Eugene metro area, State Highway 222, Highway 99 north and south ... Junction City to Cottage Grove.
Western Douglas County.

STRSS15A: What are those other distresses you have seen?

A lot of weeds growing in it which causes humps.
Any time you have a diesel spill you have to replace the f-mix rather quickly or it turns into a large pothole.
Asphalt is sunk on ditch ..some underground near the telephone line..... A little rut.
Fluids getting into f-mix, like diesel, gasoline, softens up the f-mix, we end up grinding that area and laying in a course , close mix grade.
Grass growing in the joints.
In the curves where it will start pushing.
In the f mix we have in a mountain pass, that whole area has become wash-boarded from trucks using chains, the snow plows chattering on that, and studded tires have all combined to put a wash board on that whole area. We have a plan to replace that area and replace it with a dense grade, a b mix. In general, I'd say f mix should not be used on steep grades where trucks will use chains or where you'll have a lot of plowing.
It looks like the oil is migrating within the mix (possibly from downgrading trucks?).
It’s susceptible to snowplow damage.
Just the chatter by the snowplow.
Pushing/tearing due to the traffic pressures so you see heaves and dips.
Pushup, grass and moss growing out of it.
Shoving, delamination.
Some heaving and shoving. Asphalt rises and it gets push out.
The potholes are a product of what I call delamination; in delamination you have potholes popping up and a lot of time it is reflective, but not all the times. Sometimes it is the top layer that didn't stick, that is what I mean by delamination. It is not the result of reflection.
The rumble strips are falling out and creating a big channel.
The striping doesn't show up very well, it’s so porous, it takes a lot of paint to give you a good stripe.
The water pools in places and creates a thick layer of ice - ice flows.
There have been some pop outs and vegetation growing out of it.
They get clogged with grass and vegetation growth out of f-mix along bridge gutter.
They have to cut drains in - every 200 feet you get a thump - the water fills up the roadway and comes to the surface and forms ice in the winter.

Wash board conditions, mountain pass area, due to snowplowing.
Washboard. You get scallop ..high and low in overall surface area. I have seen it a lot especially heavy plow areas.
We have had some vegetation issues - it's not uncommon on the shoulder to see grass growing up through the rocks.
When they put it down on a steep grade it delaminated and pushed up big bubbles.
Yeah it stays frozen longer.

FOGOFT: How often are those pavements fog-sealed, on average?

It's one of those deferred maintenance items because we can't get funding. It should be every five years though.
Once only.
Only done once - funding needed to repeat.
Only once - funding is not available.
Only once - funding not available.
Only once and don't know when we will do it again.
Only seen that happen once.
This is the first time.
We only did it once and unless someone comes up with some money, we will not do it again.

FOGLONGA: What is that evidence that fog-sealing prolongs the life of F-mix?

It reconstitutes the asphalt and prevent raveling.
It stopped the unravelling on I-5 and we are working on our third year in the section.
Just in one job in 1990...they did the overlay and came back in. Put the fog-seal on the F-mix. It seemed to not ravel out ..not quite as readily as some other stuff. I feel like there is a fine line on the fog-sealed, at that time, no one has the right answers. It's my opinion, that within 3 years, F-mix should be fog-sealed. I am saying on particular location like Highway I-5.
No statistics, but my observation has convinced me that we will get some extra years out of it.

FOGLONGB: What is that evidence that fog sealing does not prolong the life of F-mix?

Basically I see the same . . . once again, you are talking to someone who has f-mix not properly sealed. So when you have base problems, the fog seal is not going to do any good, it is strictly cosmetic.
From my experience it doesn't prolong life. Not for a long time, you still see cracks, alligatoring, some washboard.
It was gone in less than 6 months. 6 months after the fog seal, the rocks continued to come out and you could see bare spots where the fog seal was no longer there on the surface.

PREVEN1: From your years of experience, what do you believe is the best preventative maintenance for F-mix?

A good mix to begin with, so it isn't fat. Getting rid of studs.
A grind and inline.
Base repair, with rutting again being the most prevalent and it's being related to base failure.
Besides not having it, I don't think I have ever figured out a preventative maintenance for it.
Boy, we have not, we just grind alligator areas out, we haven't done a lot of fog seals.
Certainly would not put it on any passes to begin with.
C-mix works well as a patch.
Cover with c-mix.
Don't know what it would be.
Don't let studded tires or snow plows run on it. I think F-mix is more effective in wetter parts of the state.
Don't put it in mountain passes.
Don't put it on the highway.
Don't use it. (4 answers.)
Don't use it, not here in the applications here on the coast. (P: why is that?) Most of our highways here are shady, a lot of moist weather, a lot of pine needles and such, so it just plugs up. And you can't patch the stuff.
Don't use it. (P) It should not be used in snow zones because it rides rough, requires more street sweeping, more striping paint.
Don't use. Use, pave with B-mix.
Fog-sealing.
For f-mix? The only thing I know of is the fog. What would help f-mix more that anything would be put it in the right location. (P) In the Willamette Valley, or where it rains a lot or that you don't have freezing temperatures.
For small localized repairs, we inlay with a dense grade. For a larger area, we surface patch with a dense grade.
Frequent treatment - the case of any asphalt.
Get rid of it. Never put it down, to start with . That is your best preventative maintenance. Realistically, F-mix should never be put in the mountainous areas. It might be alright for the valley, but it should never be in the snow areas. We have snow plow damage, the studded tires and trucks cause most of the damage and deterioration of the pavement.
Good rotation of asphalt overlay.
Grade and repave it with dense mix with proper drainage of isolated area. Refill with dense mix.
Grind and inlay.
Grind and inlay; hand patching with jack hammer.
Having a good formation and laying it properly.
I don't know.
I believe a fog seal is the best maintenance.
I don't know. (P) I haven't worked with it.
I don't have an answer.
I don't know - limited experience.
I don't know - that is our problem.

I have no idea. (P) I don't work with it.
I have not worked enough to determine that.
I haven't a clue.
I haven't had a lot of problems. The biggest thing I see- when putting it down, they need to do it right. They've done some overlay on it. They need to make the road right before you put the f-mix on it.
I really couldn't tell you - I don't know.
I really don't know.
I really don't know - I would imagine that fog-seal would remove the drainage.
I really don't know - we have not done anything to it.
I think the best shot we have is fog-sealing within the first year or before it starts to deteriorate and become contaminated.
I think they need to fog-seal it within a year or two.
If you can guarantee that it will be completely re-paved every 10 years.
If you fog-seal it, you lose some of the porosity but it prevents the washing (breakdown of oils) of the rock. When snow plowing, you can preserve the surface if you use running shoes on the plow - prevents raveling and gouging.
I'm going to say let it run its life and then replace it or pave over the top of it.
I'm thinking the fog-seal will be a pretty good idea. This isn't a preventative measure, but try to keep petroleum products from spilling out onto the road. That is my biggest concern is petroleum products on the road. I'm not sure how they could do that. And also limiting the chain restriction time on f-mix.
It has to start with a good drainage base and allow the water to escape the open grade; a good crown in your road is essential for effective drainage.
I've had no experience with F mix.
I've never used F mix in our area. We use Portland concrete. We don't use F-mix. All the black pavement are regular B-mix or C-mix.
Keep it clean ....don't allow to become clogged.
Leave it alone.
No ideas.
No opinion. (p) I don't know. There are two schools for that. It is up to you. I don't have any preventative for that. We used to choke them but we don't choke them anymore.
Not enough experience to form a judgement.
Not to put it down. [p] Me personally, I'm not it favor of F mix. Because it's so difficult to repair, we use so many maintenance dollars that could have been used for other things.
Not to use it.
Not to use it. (P) I don't know.
Probably fog-sealing.
Probably fog-sealing but I have not tried yet.
Probably the fog-sealing: prevents stripping by replacing the material; helps seal tracks that are developing; helps bring pavement back to life and reduces the brittle quality.
Put a dense grade over it.
Put it in the right spot, keep it away from the mountain passes, keep it away from where you're doing a lot of plowing. Plows are the enemy of f mix.
They should follow up the next year or so with a fog-seal.

Put it down on a good base material. The rutting section, the truck rutting situation was on a soupy b mix with too much oil in it. So it was soft and in the heat of the summer it gets so soft the truck ruts continue and get deeper. It doesn't happen in the winter which is why I think it is from too much asphalt in the base mix.

Um...I don't know..(P) I have no idea.

Um...One of them is when they use a lime additive. It makes the asphalt stick a bit differently. Do the fog-seal on different time frame based on geographical location. Outlaw studded tires. We don't get too bad here but when I worked around the state, studded tires do take a major toll.

Um...probably chip seal.

Um...probably fog-seal.

Um...when it gets bad enough I would recommend a light chip-seal more than a fog-seal... Actually you put rocks on it quarter ten chip-seal or larger...that's the treatment that we were going to do simply because I don't believe fog-seal are doing any good. Chip seal is the next step in treatment.

Um..I am not sure..(P) Grinded inlay.

We don't know. (P) I don't know.

Well, there again it boils down, the best way to make a f-mix work is that whatever base you are putting it on needs to be good. If you put down a properly installed b mix lift on to put a f-mix over is the only way to get a good result.

Well, we're back to, the only thing that I've come up with is the fog seal in maintaining it as F mix. Almost anything else you do is filling in the void and it wouldn't be F mix anymore.

You have to treat it; have a good maintenance program which keeps track of fog-sealing needing to be done.

You've got to keep it fog sealed and chip sealed.

PREVENA: What are those (ideas you have for how to improve preventative maintenance for F-mix)?

A clearer understanding of what maintenance should be happening on the f-mix. And under the current budgeting, I don't think they would be able to do a regular maintenance on f-mix throughout the state.

A more dense grade asphalt would have to be more readily available out here; applied with a machine which is not available; technique - most maintenance folks don't know how to deal with it.

Be selective where I used it.

Do more chip seal ... They have a way to do it without clogging them up.

Fog-sealing may work but I am not sure - to try I need the available funding.

Fog-seals might help.

Good funding source and maintenance program.

I guess the only thing is if you could get F-mix in smaller quantities so you could patch with it.

I think it needs to be fog sealed every 2 years instead of, I think its been done every 4 - 5 years.

If someone could come up with a way to patch the gouging - perhaps injecting a crack sealer.

In the limited time I've been here, the only thing I would mention is the need for funding maintenance on fog seal every 5 - 7 years and right now we just aren't funded to do that.

It would be nice if there was a cheap good way to fill the rutting and not destroy the permeability of it and I know that that is the 64 thousand dollar question.
Just use their heads when they put it down to begin with.
Limit its use to high speed, multi-lane facilities where spray advantage is prevalent.
Make the schedule, either do it or not do it.
May be we could try fog-seal and sand- seal.
Maybe if it were fog sealed every year, but we don't have the funding to pay for that. Fog seal is so expensive we can't afford to do that and to also pay for the patching and things like that. If the design folks had the money to keep it up, but we don't have the money to do that. At first we were doing it every 5 years, but they found out that wasn't frequent enough, so they started doing it every 3 years.
More data and research regarding fog-seal. It's still unknown whether it needs treatment or not. (p) no, I don't know.
Not putting F-mix down.
Once again, they should cover it with a fog-seal to prevent the rocks getting loose.
Probably fog-sealed.
Probably if we fog-sealed.
Probably the biggest thing is the additional funding for the fog-seal.
Quit fog-sealing and install it properly the first time.
Shoulder rebuilding, blading, rebuilding and ditching to get water away from the road and the base.
The only thing that needs to happen is that the maintenance crews have the proper equipment so that they could repair it the way it was initially put down. That's the only way to maintain it.
Training - we need to know how to use it. Availability is not there.
Use a B-mix: it's proven, it's cheaper, it's easier to maintain.
Use a dense grade.
We have to get a handle on the stud ruts, that's the biggest problem.
Well, we've tried several different things, we've tried fog seal and we've tried chip seal with mixed results, and we've tried inlay patching with dense-graded mix -- with inlay patching you have to be real careful with the quality of the work so that the F-mix at the edge does not ravel. One thing that we were doing was sealing along the edge of the F-mix patch and we've stopped doing that because the water migrates through the f-mix and stops at the dense mix patch and then pops the patch making pot-hole. It seems to work better if the patch is not sealed along the edge.

SUCC17A: What is that other kind of road maintenance technique that you have used?

Asphalt plug for bridge joint. We do use percol for a rut in bridge joint. And the cold mix for a temporary fix until we got some hot asphalt.
Back in the earlier days we would take AR4000 and put a layer of oil on and a layer of rock and just make your own asphalt.
Grid it and inlay with B-mix.
In potholes we put hot mix in winter instead of pre-mix.

Use regular cold mix ....special formulated cold patch repair and use it.
Use rubber and wash the aggregate, called rubber and rock patch.
We have used hand patching pot holes with c mix and it has been successful.
We use instant road repair and it is only for small area. It's expensive. It comes in small quantity's. So far it has been working very well. We use percol more on concrete but not asphalt.
We've used hot asphalt for potholes, and that's been somewhat successful.

WINMIX: What procedures have you found to be effective in maintaining F-mix pavements during the winter?

Applying anti-icing agent. That's the most successful.
Basically try to keep the shoulder swept of sand and debris.
Be properly trained to know what it should look like. When putting de-icer (magnesium chloride) down, monitor the amount applied - you might need to spray more quantity and frequency.
Chemicals - CMA - for frosting.
Do hole patching. Put pre-mix, and all we do, put pre-mix in a pot hole. It's somewhat effective.
For ice conditions I like using magnesium chloride, plowing, and when you have to, sand.
Given that f-mix is open graded, the de-icers fall into the pores and this requires a larger quantity to be used.
Grinding and inlaying.
Hot boxing is about our most successful.
I don't know. (p) Because I work on bridges.
I don't that we can say that we have been really successful. The porous nature of f-mix does not allow the de-icers to stay on the surface where needed and the de-icers become dilute because of the f-mix retention of water. Magnesium chloride is more effective than CF7 or CMA. The excess moisture near the river dilutes it even further. When water travels down the steep grade, the water builds up and causes ice build up and flows.
I have had no experience working with f mix.
I think our crews have applied more de-icer (magnesium chloride and cf7). Sanding also works as well on open, as on dense.
I use magnesium chloride and it's effective as a de-icer.
If we did not utilize liquid de-icers I think we would have a lot more problems with the f-mix than we do now.
If we have dry weather we get some hot mix (c-mix) and tack.
In terms of snow removal, we treat it the same as dense and we use magnesium chloride. Repair potholes with cold pre-mix.
Is de-icer which is magnesium chloride; pre treating it with it actually works best.
It's an ongoing battle cause the water keeps coming up every time it freezes. If we use a heavy CMA, you have to put a lot on but it still won't hold. Sanding works but you have to stay on top of it.
Jack hammer it out and inlaying modified c-mix; occasionally we have to inlay with b-mix.
Just normal sand, keeping CMA.
Just try to get your road plowed off and try to keep it on the shoulder to allow for drainage.
Liquid de-icer.

Lots of CMA (f-mix holds moisture and freezes more readily) - actually we have had to use magnesium chloride.
Magnesium chloride, but we have to apply it about twice as heavy as we do on the dense graded.
Magnesium chloride is the most effective, sand is second.
Maybe sanding to fill some voids and that's about all we do.
No experience. Potholes are patched with c-mix; if dry, we use hot mix.
None.
None. F-mix is real hard for us to maintain. You can't get it- if you have to patch it , you have to use c-mix.
On concrete and dense graded, we use chemical spray to de-ice the road. Has caused a few accidents on f-mix roads, on f-mix we just use regular sanding material.
Our standard practice is to use a 30% solution of CMA, and that has proved to be somewhat successful.
Our winter operations for icing conditions is magnesium chloride and that is really effective with it. And sweeping and flushing. And that's about it.
Patching with a cold mix is 50/50 - that's about the only thing we have used.
Plowing and sanding.
Pothole patching with regular patching material, hot asphalt, screed patching.
Pothole patching with special mix (very flexible cold patch). Run the shoes on the plows to prevent gouging. Keep the ice bits off of the actual asphalt.
Reduced plow speeds. Try to prevent the use of chains.
Rubber bit for plow. And skitshoe. Apply more evenly.
Sand and magnesium chloride.
Sand is as effective as anything which we don't do much of. Magnesium chloride is working well.
Sand it and treat it with magnesium chloride.
Sanding is the most effective. De-icers are not as effective because of moisture and rain.
The de-icing works well - the sanding tends to plug it up. Magnesium chloride works well for us. Plows work fine (without shoes)- normal winter maintenance works well.
The only thing you can do- hot box or cold mix.
The sanding has worked; we found that plowing works if shoes are on the plows (this prevents tearing up the f-mix).
The snow storm there, there wasn't much.. (p) Hope the right weather to go up. You choose emulsion tack coat and if hot asphalt is available, like c mix, then place it and roll it in. Depends on availability.
This is just something we are just starting in our area and that's chemical de-icers.
Um the only thing we've tried and it's been fairly successful is hand patching with cold mix.
Um...it's hard question for me. In the winter time snowplow it. The plows get to jump in f-mix. The plow's grind creates a rough ride. (p) The effective procedure is to grid it off and pave with dense graded mix.
Um...the only thing use de-icing... We have to do the de-icer within 60 minutes before the storm. We don't do pre-treating because it's not effective, the material goes down into the asphalt. F-mix ruts faster with studded tires.
Um..I used de-icer and I have to use in a higher rate in f-mix versus dense graded.
Umm ..we haven't had to maintain them yet. They are a fairly new overlay.

Um..I would say we haven't had much luck with f-mix during the winter. It freezes it up. Water gets in the lower spot of the asphalt. It's harder to treat with de-icer.
Using de-icers: they are all effective but magnesium chloride is more temperature sensitive than CMA.
Wait till it dries out, grind it and then inlay. Winter tire chains will chew it up. F- mix.
We are just going with the standard pot hole patching.
We do find out that depending on water concentrations (pooling on the surface) the de-icers become dilute so we have to change the quantities to be effective.
We don't have any f mix, the last time I worked with f-mix was 10 years ago and I transferred over here 7 years ago.
We go out there and just fill it with hot asphalt and square it the best we can.
We have had some pretty good success with using anti-icers on it.
We have had to use CMA and spike it with cf7 (a higher concentration)to lower the freezing temperature of the anti-icers. We have had to experiment with different de-icers as we have significant freezing problems. Sanding is used as a last resort.
We just do standard pothole patching with premix and try to hold it together until summer.
We like to grid the inlay and pave back whatever mix is available.. We can do that in the rain.
We try to get the snow off as soon as possible.
We use a lot of de-icer and sand, though the sanding is less successful, The cinders tend to be more successful because they go into the pores more easily. We use both CMA and magnesium chloride and they work well, if applied appropriately (CMA is temperature and moisture sensitive).
We use CMA on f-mix. You've got to use high quantity of it for two reasons: so it sucks more in it and draws some moisture back out of the f mix so you've got to overcome that with more chemicals. On Highway 101 we don't have icing problems on the road, so f-mix is good for it but when you get in land that's not very welcome.
We use de-icers quite a bit in the winter. That and sand.
We wait until we see the thing needs to be repaired - we don't know what to do with it.
Well I'm using rubber bits to plow with. I'm also using shoes on the plows. This is to prevent plow chatter. We've also driven beside a plow and taken videos of the plow to see what kind of movement it has on the road.
Well, we really don't have any techniques, to be honest with you that are any different than we do in the winter with our normal grade.
Well, I guess I increase the amount of material I apply significantly to compensate for the hidden moisture, then I will reapply it sooner. We have to keep going back.
Well, probably using the chemical de-icer and routine plowing and sanding. We don't treat those f-mix any different than any other highway in the district.
Well, we generally sand everything. It doesn't make a difference after you sand them. You have to use the right type of de-icer. If you don't, it just goes down to the mix, porous mix.
We've been using a lot of magnesium chloride de-icer.
Would not apply to me, we don't use f-mix in my area.
You plow longer, you sand longer, have a lot more accidents.
You'd just a soon not have them at all. If you're going to have f-mix where you have to plow, make sure that your crew have shoes on their plows and slow down, because there's chance for damage. If they go too fast, the plows chatter.

BEST: From your perspective, what is the one best thing about F-mix asphalt?

Drainage.
Driving in the rain you don't have the over spray on the cars. Very good for that.
During the winter the spray on the windshield is a lot less, better visibility in the winter for drivers.
Get safer roads because less spray is thrown up from the wheels from traffic.
I have no experience with it.
I like the no spray.
I think it does allow the water to go down through.
I think the best thing about it is being able to move the water, to limit hydroplaning on the road. And it creates a larger friction area for the vehicles.
I think pretty much the reduction of spray from the traffic, from the water.
I'd say the only advantage that I've seen, it does reduce the amount of spray coming up from the traffic, but that only applies for the 2 or 3 years; after that it plugs up and the purpose of it is defeated.
Is that it reduces road spray in wet weather...that's the only redeeming feature.
It does keep down a lot of the road spray during rainy periods.
It does reduce the surface water.
It doesn't produce as much spray off the trucks.
It doesn't spray.
It doesn't spray as much.
It has less spray and a little less rutting from the trucks.
It helps some of the water get off the road.
It holds down the spray from larger trucks and bigger vehicles.
It keeps the splash and spray down.
It limits spray off the trucks.
It reduces road spray - the only redeeming feature I see.
It reduces road spray and, when new, has very good traction.
It reduces the spray which results in safer driving in the rain.
It the bridging capacity; or the bridging strength would be the correct terminology. We like it because there isn't any truck rot. We don't have any truck rotting here. And it seems to outlast our b-mix here. And it also takes the rain so you don't have any water splatter. You don't get the hydroplaning.
It's ability to drain water off the roadway.
Its ability to eliminate water spray - creates a lot better visibility on the road.
It's friendly for motorists in the rainstorm.. Reduce the spray.
It's intended to reduce spray but when you have days on end of rain this does not work well i don't see any real benefit to it & it's too expensive and requires more maintenance.
Looking at it from the consumer side it is an effective way to control spray.
No spray coming up of the trucks.
No water spray until it gets clog up.
Noise reduction; when it's freshly laid it helps reduce sand because the aggregate is removed; it reducing the misting of tires.
Nothing - i have had nothing but bad experiences with it on both sides of the state.
Nothing - when you have to deal with it there is nothing good with it.
Nothing (p) ... Nothing.
Nothing good about f-mix over here (eastern Oregon).

Probably keeps the spray down.
Probably the only best thing is reduced spray. It seems to knock the spray down, but that would be the only positive effect i could see.
Probably the stability [p] well it seems to be pretty tough and endure heavy loads.
Reduced sprays, water dissipation.
Reducing splash and spray.
Reduction in spray in the first five years.
Reduction in standing water and spray from one vehicle to the next which improves safety overall.
Reduction of road spray and also its resistance to truck rutting.
Removes spray from the vehicle traveling over it.
Resist truck rutting.
Safety and no spray.
Sheds water when it's new - once it gets clogged it does not work as well.
Spray resistance.
That it does drain well.
The ability to drain water from the pavement and the resulting lack of spray.
The drainage and the resulting reduction of spray and pooling of water on surface.
The lower spray for 2 - 3 year before it starts to plug.
The nice thing is it reduces water spray and people tend to enjoy that more on their drive.
The non-spray.
The only benefit is the spray situation when it's working correct- this is probably the only thing holding it in the arena.
The only thing I can come up with is the initial installation is cheaper.
The only thing. I see is.....it reduces waters spray.
The open surface might provide a little better traction.
The spray reduction.
The water tends to run through the mix so you don't have a road spray.
The wet weather travel and reduced spray.
They don't have the over spray that you have on the dense graded mix.
Um, I'd say spray reduction.
Um..it reduces spray. It's quite . . . it has good wear, surface, life . . . these are the top three.
Um..the lack of water spray.
Um..two good things, it holds up to trucks very well and there is reducing water spray.
Well, we all know that f mix reduces spray in wet weather.
Well in the perfect world, in a freeway situation, you get less spray and such. There are advantages to it. It just doesn't belong on the Oregon coast.
Well when it works right it significantly reduces the amount of spray that is picked up and kind of atomized and reduces your visibility. So it reduces that quite a bit.
Well, I don't like it. I don't like any. (p) They reduce spray when it rains.
When it rains you don't get the spray.
When it's new it does a very good job of keeping the water off the road.
When it's new the drainage and the road spray, the road spray is nonexistent, the drainage is excellent and the ride is outstanding.
When you get rain, the water gets off that road much quicker, don't have the vehicle spray.
You don't get as much road spray in wet weather, and the surface drains.

You don't have the spray flying up on the windshields.

IMPROVE: If there is one thing you could change or improve about F-mix, what would it be?

Again, I have had no experience with f-mix.
Better data on how to maintain them.
Change the consistency of it to make it more understandable.
Covering it with c-mix. (which is a dense material).
Develop techniques to allow it be maintained more easily.
Don't have enough experience to answer.
Don't put it on mountain passes.
Don't use it.
Don't use it (p)...if they can come up with some kind of polymer and better binder to stop it from ravelling it will be a great mix. It can't be used in the snow zone area....and have a fund to treat it every 3 year using fog-sealed.
Don't use it. I'm not an engineer who designed it so I don't have a good answer for that one.
Don't use it. (p) Well, I would say don't lay it no less than 2 inches thick.
Easier to patch and maintain.
Find a way to make it less susceptible to tire chain and plow damage.
Find some way of letting the water run off - it clogs to easy and it's not very easily worked.
Get a consistent formula so that the quality does not change when the mix changes and this also prevents rutting.
Go down with a b or c hot mix.
How to do it. The procedure to do the overlay of it.
I don't know.
I don't know...(p) I am not much familiar with it.
I don't know.(p) I don't think we have any problem with it. If you have the utility company go out and dig up the road, when they put their facility in and come back. And they put the road back, they overlay b-mix. We don't always get f mix put back in the same way.
I don't really know, I'd rather see a non-open graded f-mix, no voids, used to have a mix: can't think of name of it.
I don't think there would be anything, from my standpoint. If we could keep petroleum products out of it, that would be great. That is my only real concern with it is when petroleum products get into it and get to the surface. Other than that, I think it is a great mix.
I guess availability ...no supplier...(p) I don't use it.
I guess get to use some of it.
I guess...I don't know...(p) Work the same way but not be so porous because it collects dirt and seeds from grass and weed.
I have water coming up at the center line and this freezes every year: the f-mix needs to allow for better drainage to avoid ice flows the weight of the trucks causes rutting on the f-mix: it's too soft or the trucks are too heavy.

I think our crews need some improved techniques for patching it (inlays and overlays).
I wish we could get a more consistent design or a design that always works.
I would certainly look real seriously at the locations of it's use change the gradation - make it finer than it is - it is too hard to work with.
I would guess maybe a different kind of oil, one that had more bonding agent to it so that the rock would not come out and ravel away. Probably a harder oil, not a softer one. I think our oil is too soft. We use a palmar base asphalt now which is softer than what we used to use. I think it is a large part of our problem.
I would like to see the locations where it is placed to be screened a lot more carefully (such as multi-lane where vehicles are going to pass more closely - not use on two lane highways).
I would not like to see f-mix placed on mountains.
I would really be sure that they followed up with a fog-seal so that it's life is extended.
I would say getting asphalt plants to produce smaller quantities.
I would say to, it's too open, it probably needs more fines. And I certainly use it as an overlay, for new construction only. If you use it as an overlay, the water will collect underneath it and obviously when it freezes you're going to have all kinds of problems.
If there were some way to keep it from clogging not as soon as it does. If it could go 5, 6, 7, years without clogging, that would be a great improvement.
Improve it's resistance to abrasion to stud and plow. It would be very good.. We got better result of f-mix here.
Improve it's water holding capacity in the winter.
Improve procedure and use of it through proper training and patching techniques- i.e. If you don't grind out all the way to the edge of the pavement, you create a dam which is where the water collects -in the winter this creates ice flows which tear up the surface considerably.
Improve the maintenance program with the ability to do fog-seals (requires additional funding).
It needs to hold up better for studded tires. I won't recommend to use anywhere in the Bend area.
Its availability.
It's susceptibility to damage from plowing.
Limit its use to selected higher speed, multi-lane facilities.
Make it easier to repair.
Make it more easily accessible.
Maybe make it more durable with a longer life expectancy (by keeping the grades open).
Not a clue - lack of experience.
Not quite as an open graded, allowing it to drain, but giving it more stability.
Not to have it.
Not use it at all in higher elevations - listen to the maintenance crews who are familiar with their sections and the problems they have with freeze/thaw.
Nothing.(p) I don't like it. Because of, to repair it right it's a lot more costly. Tends to not dry out as fast during the time. That requires more sand and deicer.
Possibly changing to a more dense graded mix which would be easier to patch and maintain.
Probably put a few more fines in it so it's easier to work.
Probably the maintenance, better techniques for maintenance.
Properly select the areas for f-mix: multi-lane, flat roads, no hills, curves or corners - basically use only on interstate type systems.
Put some finer rock into it and make it more dense dedicate the funding for proper maintenance.

Reduce it's scarring ability.
Stop the stripping that occurs; come up with a formula so that it holds the asphalt better; don't use it at all.
That it was ever manufactured in the first place? [p].
That it would not rut out and hold up better.
That's a tough one and one of the things I've noticed is if we have any kind of a diesel spill, you get delamination over a larger area and that's probably the worst drawback for f mix or any open grade material.
The difficulty to maintain it - to patch it.
The ease of using, handling and laying it (issues with putting a dense grade with an open grade).
The polyfibers should be reintroduced to aid in the oil binding and strength of the f-mix.
To be able to work with it - if it were easier to patch.
To improve the drainage issue that I am having cause it's causing all my problems the fat spots are causing potholes and damming of the water which causes cracks and splits during freeze/thaws.
Turn it to a c or a d mix.
Um...I'm sorry...I don't know (p) I don't know.
Um..I think..I am not sure..it seems to ravel, keep it from ravelling.
Um..I would, I don't really care for f-mix in the mountain. I would say use f-mix in low elevation areas, not where there is lots of ice and snow. (p)No opinions.
Um..in my case it's a pain in the neck.. Striping. The rock was too hard when put f-mix. (p) Probably not use it. (p) Figure how to make the material so it doesn't ravel out. Something they're missing. Make it, premature raveling. I don't know....whether.. Not enough aphalt..the type of rocks... Things like that.
We wouldn't use it in snow zones.
Well I'd just make sure that any of the subsurface below the f-mix was installed properly.
Well I'd like to see that the aggregate used in it was a harder aggregate. You can also put in there to outlaw studded tires.
Well the best thing would be to improve the availability and easier transport - marbles are coated with oil and tar and this is very messy like syrup dripping all over the road as you are driving - leaves about a 3 to 4 inch layer of oil caked up in the back of your work truck which requires a backhoe with a scraper to remove.
Where they decide to put it.
With a wider range and availability of equipment we could probably do something with it but this requires an adjustment in the budget.

INTOBS: Congratulations Interviewer! You have completed the interview! Please write any comments below.

During winter plowing, the steel blades peel off the hump of the road, take off the high spots, causes raveling and washboards, no longevity.

First you have to use twice as much deicer to be effective on f-mix. In addition, we live in the grass seed growing capital of the world and grass seed grows very well in F-mix. It stops drainage, so I have to spray it and that increases the cost of maintenance. Furthermore, when we are doing shoulder rebuilding, we pull the rock up and the fine particles clog the f-mix destroying drainage. What I am saying is, not only have we not developed effective means of maintaining the surface of f-mix, we have not developed effective means of maintaining the shoulder.

I have a whole district to work with (5 section crews who actually do the work); I do not do the maintenance directly; I am not very experienced or knowledgeable with the success of various techniques.

I have only been with ODOT for 11 months so I do not have the 2-year perspective on pavement distress on F-mix.

R commented on the questions about ..rare, scattered, or pervasive. He said "you can't generalize it. You have 3 year old pavement, 15 year old pavement....and so on. You have all kinds of different year old pavements. I can't answer those questions for you.".

R does not have a lot of experience with F-mix maintenance as they recently laid down the F-mix (within the past two years) and thus have yet to repair any of it.

R has much more experience with F-mix in eastern Oregon where he worked for many more years R has only worked in his current district for 2 years.

R is a district manager. His subordinates in his team work with F-mix asphalt but he doesn't.

R recommends trying sand-sealing (oil and real fine aggregate) to lengthen the life reduced by ravelling and alligator problems.

R said he has zero of experience working with F-mix asphalt. He works on bridges.

R said he worked in Region 3 which covered both District 7 and 8. I could put only one code. I put 7.

R says F-mix is useless in eastern Oregon where they have had only 4 inches of rain - it's much better west of the mountains.

R told that he didn't use F-mix in his area. He said, "we use Portland concrete. All the black pavements in our area, we used B-mix or C-mix.".

The R said that there is no f-mix in his area and has not worked with it, even though he has had 20 years experience working with asphalt pavements.

The R said that you can't treat or really "maintain" f mix; that if you treat it with fog seal, you destroy it's purpose; and when it fails, you must just replace it. There's no actual preventative maintenance to be done.

The R said: the way the survey goes, it doesn't address the issues, and when it is all tabulated the survey will be meaningless. I have dated pictures, which I've shown and are on my share-drive, of ice and snow on f mix, and of f mix and d mix butted up together showing their difference in wear.

We don't use any f-mix in our area.

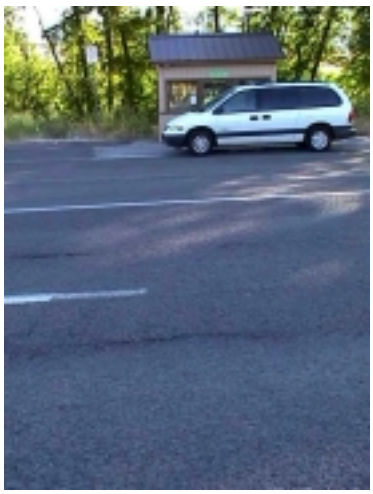
APPENDIX D– SURFACE DISTRESS SURVEY, PRIOR TO FOG SEAL, US 99 MP 12 – 17, JUNE 1999

June 13, 1999
Fog Seal
U.S. 99 MP 11.93 – 17.02 (between Medford and Ashland)
Photo Log

Data collected morning of June 13, 1999

NORTHBOUND LANES:

17.0 – 14.0 Little visible distress.
16.8 Light raveling.



#17 Looking east across NB lanes.

#18 Raveled area with crack.

#19 Close-up .

#20 Texture from waist-high.

14.0 transverse and longitudinal cracks in fast lane

#9 Cracks near MP 14.0

13.7 light ravel.

13.6 longitudinal crack in outside wheel-track.

13.5 transverse crack & light ravel.

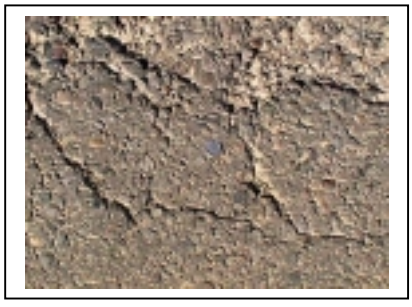
#10 transverse cracks

#11 close-up

12.5-12.4 Heavy ravel in outside wheel-track

#12 looking south

#13 looking north



#14 close-up

12.4—12.3 Ravel in outside wheel-track

12.1 – 12.0 Light ravel in outside wheel-track

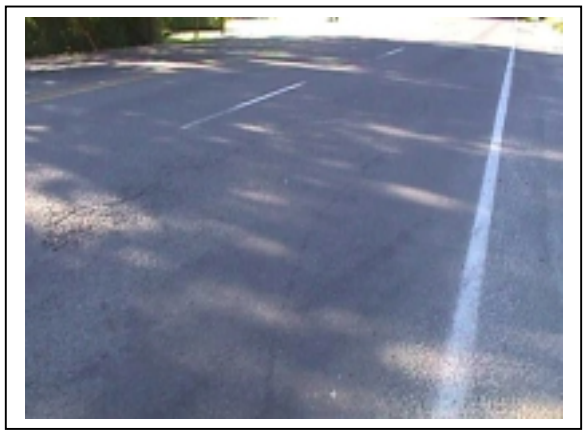
June 1999
Fog Seal
U.S. 99 MP 11.93 – 17.02 (between Medford and Ashland)
Photo Log

Data collected morning of June 13, 1999

SOUTHBOUND LANES

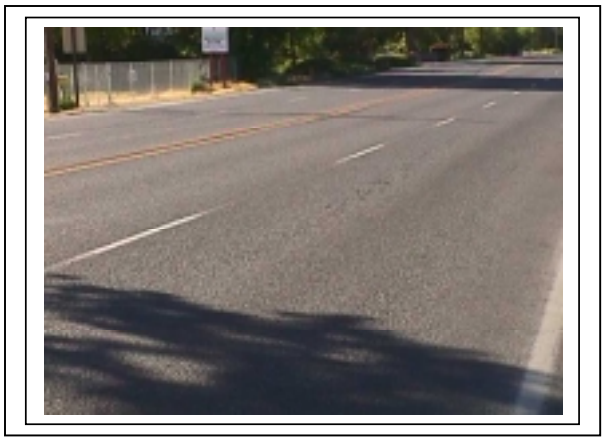
Move to north end. Set trip meter to 0.0 at MP 12 headed south.

12.0 – 12.1 Light Ravel and cracking.



#26 looking south at D&S Harley Davidson – ravel and crack

12.0 – 12.9 High frequency of ravel and intermittent cracks



#27 Looking south between 12.1 and 12.9 SB.

#28 Ravel @ 12.9 SB

#29 Crack near 12.9 SB.

#30 Crack near 12.9 SB.

#31 Looking back north @ 12.9 SB

12.9 – 13.2 More of the same

#32 4 transverse cracks near Compass Rose Store

#33 Close-up of cracks near Compass Rose Store

13.2 – 13.7 Similar crack patterns

13.8 – 14.0 Longitudinal wheel track cracks

#34 Cracks in front of VRB Bank

#35 Cracks in front of VRB Bank

#36 Close-up of crack in front of VRB Bank

-- end disk 1 –

14.0 – 14.7 Similar cracking (14.4 --Severe longitudinal crack inside wheel track – almost looks stripped out).

14.7 – 14.9 Heavy cracking (longit.) in inside wheel-track

#1 In front of Valley Forge Welding.

#2 In front of Valley Forge Welding.

#3 Close-up of crack in front of Valley Forge Welding.

14.9 – 15.3 Longitudinal cracking in interior wheel-track

15.5 Lost rock
15.6 Little distress
15.7 Cracks in interior wheel-track

#4 Directly across from #1820 mailbox.

#5 Directly across from #1820 mailbox.

15.7 – 16.0 Little or no distress

16.0 Incipient longitudinal crack in interior wheel-track

16.0 – 16.9 Little or no distress