



Dust Storm rolling into metro Phoenix, looking N from South Mtn Park, 06-27-2015, D. Henz

Flood Control District of Maricopa County

Engineering Division, Flood Warning Branch

MSP Verification Report & Season Recap: Monsoon Season 2015



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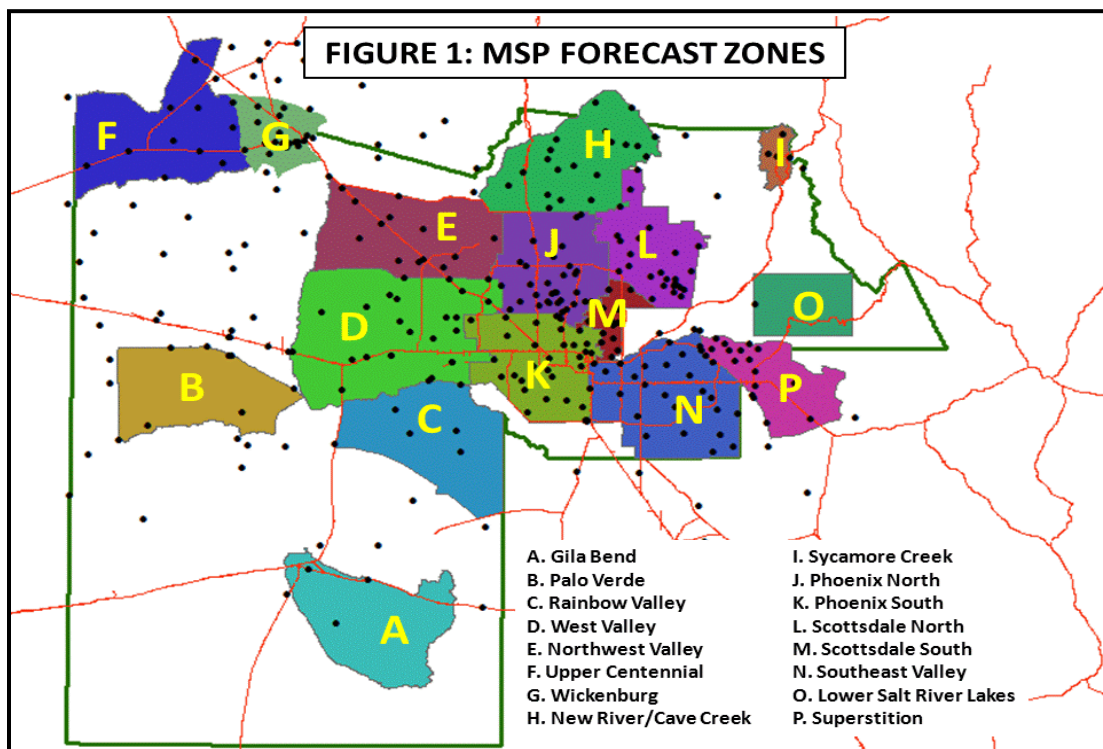
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INTRODUCTION

This report was generated by the Flood Warning Branch of the Flood Control District of Maricopa County (FCDMC). It covers the length of the monsoon season as defined by the National Weather Service Phoenix WFO: June 15th- September 30th. This report includes daily records on Weather Outlooks and Statements issued by the Meteorological Services Program (MSP) as well as a complete verification and summary of these products.

The Flood Warning Branch of the FCDMC operates a year round MSP that's purpose is to provide detailed meteorological forecasts and support to county, city, and other local agencies. The program covers 5,400 square miles encompassing Maricopa County and surrounding watersheds. The goal of the Flood Control District's MSP is to reduce response time for emergency managers by providing timely and accurate weather information, primarily regarding the potential for flood-producing rainfall. During the length of the Monsoon season the MSP goes on a weekly rotating 24/7 manned schedule. A Duty Officer is selected for each day who is responsible for issuing MSP products, providing support to clients, and serves as the on-call supervisor during non-business hours. A supporting officer is also named and can be available to the duty officer in the case of a significant weather event. All MSP forecast products are disseminated via email, fax, and occasionally via pager. Emergency managers may also be notified by telephone to aid in decision making.

The MSP has broken down the 5,400 square mile operational area into 16 forecast zones. These zones are the primary warning areas identified by emergency management officials. A map of the forecast zone locations is shown below in Figure 1.



MSP PRODUCT DESCRIPTION

Weather Outlook:

The Weather Outlook is disseminated to clients daily no later than 2PM during the monsoon season. This product covers the today through tomorrow period and occasionally the following 2-3 days where appropriate. Occasionally, due to unexpected weather pattern changes, Weather Outlooks will be updated throughout the day or first thing the following morning. Weather Outlooks include a synopsis of expected weather conditions; the “probability of occurrence” of rain; the expected “prime time” for the bulk of the rain; and the amount of rain expected during the prime time period. Temperature forecasts and trends are included as well as a forecast of peak wind speeds. Click [here](#) for an example.

Message 1 – Alert:

When it is believed developing weather conditions may lead to heavy rain and/or minor to moderate flooding an Alert is issued. Lead time will generally be less than an hour in advance of the expected event. The Alert will normally identify the affected zone(s), the time frame of the event (valid time), rainfall potential, and the type of areas that will be impacted, such as roads and/or washes. Click [here](#) for an example.

Message 2 – Flash Flood Watch:

When it appears the developing weather event may lead to flash flooding a Watch is issued for the possible affected areas. Lead time will generally be 1 to 2 hours in advance of the expected event, but can stretch to a day or more with reliable guidance. The Watch will include the time frame it will be in effect (valid time), and a section describing what may take place (comments). Click [here](#) for an example.

Message 3 – Flash Flood Warning:

When it appears that significant flash flooding is imminent or has started to take place, a Warning will be issued for the affected areas. Lead time will generally be less than an hour. The Warning will normally identify the affected zone(s), a time frame of the event, rainfall potential, and a section describing what is expected to take place (comments). Click [here](#) for an example.

Message 1, 2 and 3 Update:

This product, issued as needed, will update an existing Alert, Watch or Warning. Click [here](#) for an example.

Message 4 – Cancel:

When an event (Watch or Warning) no longer poses a threat, and the expiration time has not been reached, a Cancel message may be issued. Click [here](#) for an example.

Lake Alerts:

In addition to the above MSP program, weather guidance is provided for Maricopa County lakes/reservoirs from June 15 through October 15. Lake Alerts are issued as needed to inform of approaching adverse weather conditions. Emphasis in these statements is on expected wind gusts and lightning activity. Click [here](#) for an example.

Additional Products:

During the summer months, a program exists to aid the Boy Scouts at Camp Geronimo. Though in Gila County, many of the scouts reside within Maricopa County. The Camp exists below a watershed that was recently burned, and NWS Flagstaff declined a request for localized support. A call is made to the officials at the camp when needed, stating the expected flood problem.

At the request of clients, site specific products may be issued to support unusual or special operations, such as specific wind forecasts to aid in the fighting of fires, or forecasting for special events at the County lakes or parks, or District construction projects.

Additional information and data regarding the FCDMC can be found online [here](#)

2015 MONSOON SEASON RECAP

According to the FCDMC ALERT rain gage network, the 2015 monsoon season was characterized as being much drier than normal. When averaged across 267 of the oldest rain gages apart of county mesonet, 2.16" of rain fell which was only 72% of the mean value of 2.99". An image showing the full 33 year period of record can be viewed [here](#). It's worth noting above average rainfall was recorded at Sky Harbor Airport for the fourth consecutive season. The official rainfall total as reported by the NWS Phoenix office was 3.29" which went down as the thirty-fifth wettest during its 121 year period of record. Figure 2, below, offers a more comprehensive picture of the rainfall distribution across the MSP forecast area. This figure was generated using FCDMC ALERT rain gage data from around the county. The shaded contours depict precipitation totals from June 15th – September 30th.

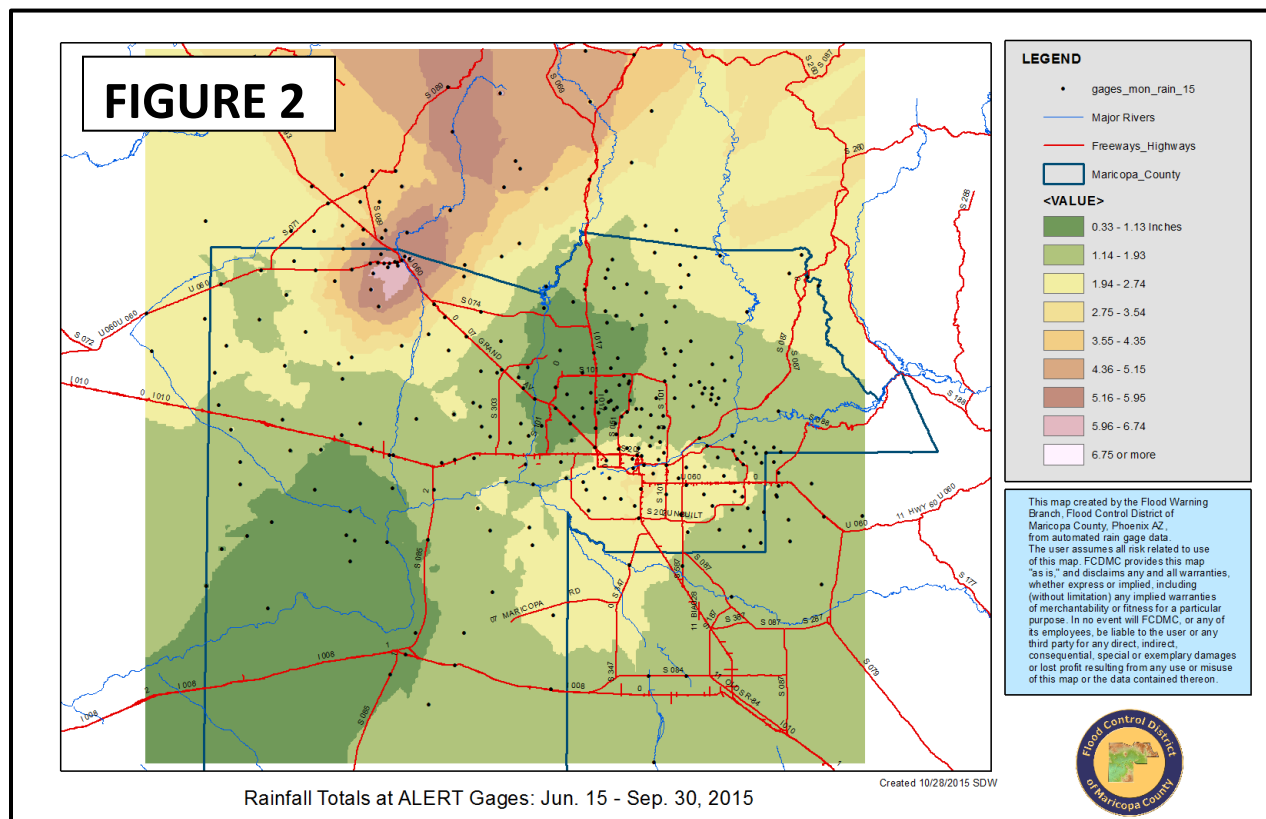
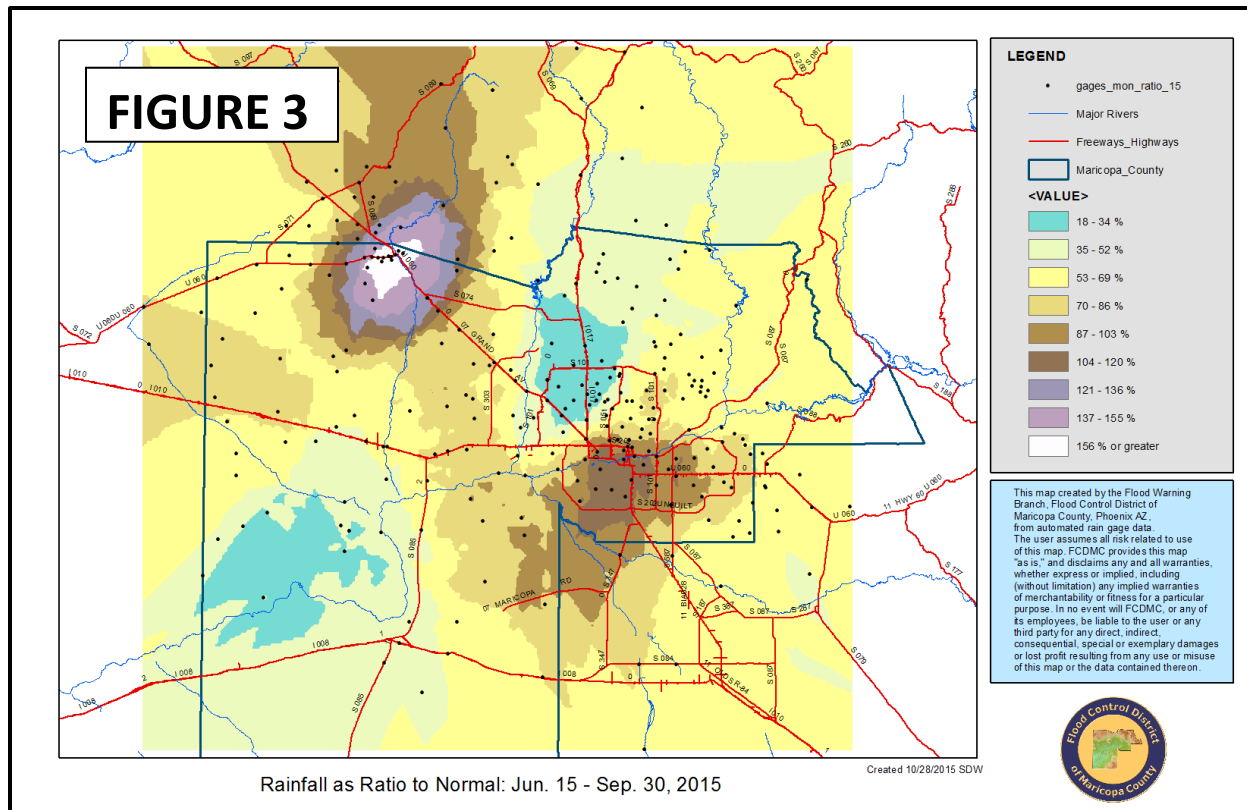
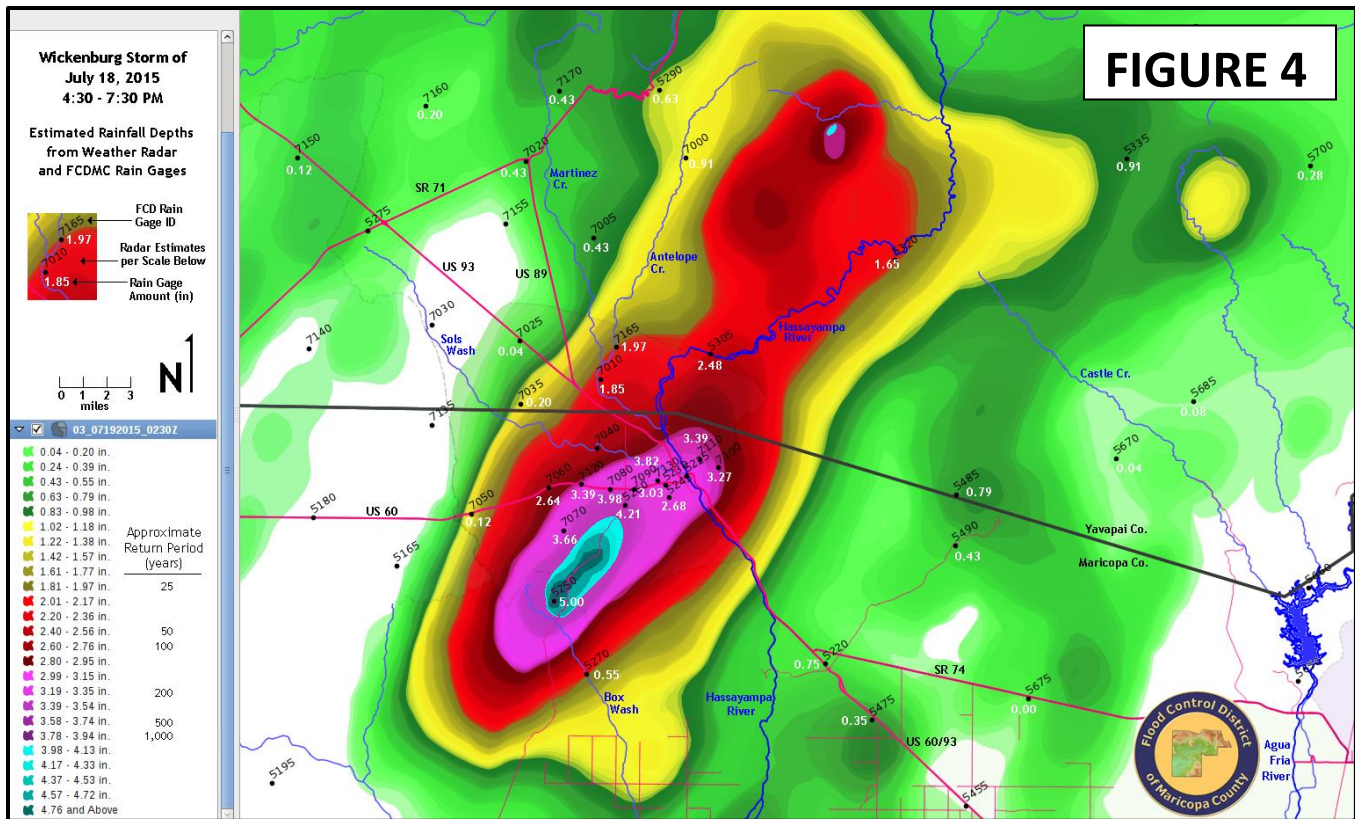


Figure 3, on the next page, shows the ratio of 2015 monsoon precipitation versus average monsoon precipitation. Similar to Figure 2, contours were generated using FCDMC ALERT rain gage data from around the county. Much of the county saw below to well below average rainfall totals for the season. Many of the traditional wetter, higher terrain, locales remained very dry. Above average rain fell across northwestern portions of the county and across the southern urban corridor including parts of the southeast Valley. These two figures serve as a strong reminder to the importance of having a widely distributed rain gage network in order to fully capture the distribution of monsoon rains.



After an abnormally wet May and early June, the operational monsoon season followed suit getting off to an early start during the last week of June. The first noteworthy summer dust storm moved southwest across the Valley on June 27th ([image](#)) behind an unusually powerful gust front initiated by convection across the Mazatzal Mountains. The first MSP message statements were issued on June 29th, where locally heavy rain fell across Aguila, Wickenburg, and the lower Bradshaw Mountains. Daily isolated thunderstorm activity continued through July 5th before heavy rain fell across the West Valley during the early morning hours on the 6th. The next ten days were very quiet weather-wise around the county as the subtropical ridge drifted into southeast Texas promoting drier southwesterly flow aloft.

A localized but historic rain event unfolded across the Wickenburg area during the evening of Saturday July 18th. An unstable atmosphere largely aided by tropical moisture associated with the remnants of Hurricane Dolores led to the development of an organized thunderstorm complex which dropped torrential rains over northwestern Maricopa County. These storms produced anywhere from 2.00"-5.00" of rain (Figure 4, on the next page) over a three hour period with many gages registering the bulk of that rainfall during a brief 60-90 minute window. Heavy rain from this event ultimately led to significant flash flooding in and around the Town of Wickenburg. A complete storm overview of this event was generated by the FCDMC and can be viewed [here](#).



Quiet weather highlighted nearly the remainder of July until the subtropical ridge redeveloped across the Four Corners region aiding in widespread t-storm activity across southcentral Arizona on July 31st. Fourteen message statements were issued across eleven of the sixteen operational forecast zones. This event was highlighted by heavy rain that fell across the West Valley and across portions of Phoenix, Tempe, Chandler and Scottsdale.

August got off to another quiet start this year with the majority of the county remaining storm free through the 6th. A weak gulf surge on the 7th led to an active afternoon across eastern zones which saw multiple rounds of storms. The next active day came on the 11th where the Phoenix Valley was hit with two separate rounds of thunderstorms. The first round of activity moved through the Valley during the morning hours which was then followed by a second more powerful line of storms after rush hour. This event was unusual in that leading outflow boundaries for both events generated significant dust storms that rolled through the same parts of the Valley. The next two weeks of August were uneventful as the summer ridge of high pressure retreated back over southeast Texas lending to drier conditions and hot temperatures. New daily record high temperatures were set on the 14th and 15th at Phoenix Sky Harbor along with record setting warm overnight lows the 14th-17th.

Activity picked back up the last week of the month with localized heavy rainfall and damaging thunderstorm wind events which occurred on the 27th, 29th, and most notably the 31st. Upwards of 1.50"-2.00" rain fell in and around metro Phoenix with the severe storms on the 31st. Numerous tree damage and power outages were also reported. More details on this event can be read in the NWS Phoenix Office storm summary [here](#).

The beginning of September remained rather active for western portions of the county. Moisture shed north from remnants of Tropical Storm Kevin and a weak disturbance moving north out of Mexico aided in localized heavy rainfall stretching from Wickenburg/Aguila south to Gila Bend on September 3rd and 4th. A few days later a weak surge of moisture associated with newly formed Hurricane Linda led to further thunderstorm activity and heavy rain on the 7th and 8th across many of the same areas.

The next multi-day event came on the 13th and 14th of September as an early season trough moved east across the Desert Southwest. Anywhere from 1.00"-2.00" of rain fell across Buckeye, Avondale, and Rainbow Valley during overnight hours on the 13th. Severe storms developed across the central Phoenix Valley the following evening bringing localized heavy rainfall leading to urbanized flooding as well as damaging winds and reported power outages. The final noteworthy weather event for the month unfolded during the 22nd and 23rd as another rigorous upper level disturbance moved through the region. The bulk of the rain during this event occurred on 23rd where portions of Phoenix, Scottsdale, and Mesa saw 1.00"-1.50" of rain as evening t-storms rolled across the Valley. This event marked the end of the operational monsoon season with dry conditions until the official close on the 30th.

MSP Issued Products Recap:

A total of 140 forecast zone-specific messages were issued by the MSP spread across twenty different days during the length of the monsoon season. Table 1, on the next page, shows the monthly break down by forecast zone of messages issued including season totals.

TABLE 1: MSP Messages Issued - 2015 Monsoon Season					
Forecast Zone	June	July	August	September	Total
Gila Bend	0	4	0	3	7
Palo Verde	0	4	0	3	7
Rainbow Valley	0	5	2	2	9
West Valley	0	5	2	3	10
Northwest Valley	0	6	2	2	10
Upper Centennial	1	3	0	2	6
Wickenburg	3	8	1	3	15
New River/Cave Creek	0	2	2	1	5
Sycamore Creek	0	2	0	1	3
Phoenix North	0	3	2	3	8
Phoenix South	0	4	7	5	16
Scottsdale North	0	3	2	3	8
Scottsdale South	0	4	3	3	10
Southeast Valley	0	5	6	3	14
Lower Salt River Lakes	0	3	1	1	5
Superstition	0	3	2	2	7
All Zones	4	64	32	40	140

Of the 140 Messages issued, eighty-two were Message-1 Alerts, forty-eight were Message-2 Flash Flood Watches, and ten were Message-3 Flash Flood Warnings. Table 2, below, shows the monthly break down by forecast zone of Lake Alerts issued including season totals. Forty Lake Alert statements were issued for the County Lakes Program including Lake Pleasant, Bartlett Lake, Horseshoe Lake, Saguaro Lake, Canyon Lake, and Apache Lake.

TABLE 2: MSP Lake Alerts Issued - 2015 Monsoon Season					
Recreational Zone	June	July	August	September	Total
Lake Pleasant	0	2	3	1	6
Horseshoe Lake	1	0	0	0	1
Bartlett Lake	2	1	6	2	11
Saguaro Lake	1	2	3	1	7
Canyon Lake	1	2	4	1	8
Apache Lake	1	2	3	1	7
All Zones	6	9	19	6	40

The Alert Operation Center (AOC) was partially activated once this monsoon season on July 18th as historic rain led to record impoundments behind three District dams (Casandro, Sunset, and Sunny Coves FRSs) in the Wickenburg area.

MSP VERIFICATION METRICS AND CRITERIA

Several key verification metrics and a clear set of operational based criteria were adopted in order to conduct a thorough and complete verification of MSP products issued during the 2015 monsoon season. This chapter is broken down into five sections: Outlooks, Messages, Lake Alerts, Peak Intensity, and Storm Total Precipitation. Each section discusses the verification metrics used and the criteria followed to compute the statistics displayed in the summary chapter sections. A list of frequently used terms including definitions and acronyms as used throughout this report is listed below.

Observed Rainfall: the amounts of total rainfall gathered from either ALERT rain gages, gage corrected radar estimations, or local storm reports (LSRs).

Operationally Significant Event (OSE): a rain event within a MSP forecast zone with observed rainfall equal or greater than 0.50”.

Hit: considered a correct forecast.

Miss: considered an incorrect forecast.

Correct Negative: considered a correct forecast ex. no rain forecast and no rain observed.

Forecast Accuracy: a measure of the ability to correctly forecast daily rainfall potential. Given in percent and calculated using Equation 1 below:

$$(1) \text{ Forecast Accuracy} = \left(\frac{\text{Correct Forecasts}}{\text{Total Forecasts}} \right) \times 100$$

Probability of Detection (POD): a measure of the ability to correctly discriminate heavy rain days (OSEs) from non-rain/minor rain days. Given in percent and calculated using Equation 2 below:

$$(2) \text{ POD} = \left(\frac{\text{OSEs Correctly Detected}}{\text{Total OSEs}} \right) \times 100$$

False Alarm: occurs when an OSE is forecast for a location but does not occur.

False Alarm Rate: measures the number of false alarms compared to forecast days i.e. over-forecasting. Given in percent and calculated using the Equation 3 below:

$$(3) \text{ FAR} = \left(\frac{\text{False Alarms}}{\text{Total Forecasts}} \right) \times 100$$

Threat Score: measures the fraction of observed and/or forecast events that were correctly predicted. TS can be thought of as forecast accuracy when correct negatives have been removed from consideration. Given in percent and calculated using Equation 4 below.

$$(4) \quad TS = \left(\frac{Hits}{Hits + Misses + False Alarms} \right) \times 100$$

Percent Error: a measure of relative error given in percent. Calculated using Equation 4 below:

$$(5) \quad \% Error = \left(\frac{Forecast - Observed}{Observed} \right) \times 100$$

Quantitative Precipitation Forecast (QPF): forecast zone or basin specific rainfall forecast including a rainfall amount given in inches and/or intensity.

Rainfall Intensity: the rate at which rain is falling including an amount in inches over a specific time period i.e. 0.50"/30min.

Storm Total Precipitation (STP): total rainfall from an identified storm or storm complex, given in inches.

Probability of Occurrence: forecast confidence, given in percent, that rainfall that could occur within a forecast zone or basin, usually given in conjunction with a QPF.

Gage Adjusted Quantitative Precipitation Estimate (GAQPE): radar estimated rainfall total, product provided by WDT Inc.

Lead Time: the amount of time between when the forecast statement was issued/valid and the onset of the event (observable).

Qualifying Event: an issued statement/QPF that counts in the verification process.

The following five sections explain the development of verification statistics as tabulated in Appendix A-E.

OUTLOOKS:

Forecast Accuracy:

Either a hit or a miss was selected for each day. A hit was assigned when observed rainfall met or exceeded the QPF. A miss was assigned when rainfall was observed and no QPF was made or if observed rainfall failed to reasonably meet the QPF. In some cases a hit was assigned when the QPF was not reasonably met by observed rainfall. In these cases the probability of occurrence was 30% or less and the QPF was below the OSE threshold. Values were then populated for each forecast zone and all zones combined. Forecast accuracy was then calculated by month.

Probability of Detection:

A dash was assigned to all days when observed rainfall was below the OSE threshold. On days when observed rainfall met or exceeded the OSE threshold either a hit or a miss was assigned. A hit was selected when the observed rainfall reasonably met the QPF. A miss was assigned when observed rainfall greatly exceeded the QPF or if no QPF was issued. Values were then populated for each forecast zone and all zones combined. A probability of detection was calculated by month and season total.

False Alarm Rate:

False alarms were denoted by an “x”. A false alarm was assigned on days where the observed rainfall failed to meet the OSE threshold, yet the QPF called for an OSE with a high probability of occurrence. The two relationships below outline the above criteria.

$$\begin{aligned} & \text{Probability} \geq 40\% \text{ and QPF} \geq 0.50'' \text{ AND Observed Rain} < 0.50'' \\ & \text{Probability} = 30\% \text{ and QPF} \geq 1.00'' \text{ AND Observed Rain} < 0.50'' \end{aligned}$$

Values were then populated for each forecast zone and all zones combined. False alarm rate was then calculated by month and season total.

Threat Score:

Similar to Forecast Accuracy, a Threat Score or Critical Success Index was calculated. Threat score is only concerned with forecasts that count (days with observable rain) and assumes correct negatives are not important. Values were populated for each forecast zone and all zones combined for the length of the season.

Tables containing all of the raw data used in generating the verification metrics discussed above for the MSP daily Outlooks can be found in [Appendix A](#).

MESSAGES:Forecast Accuracy:

A hit was assigned if a rain, stream, or dam alarm was triggered during the valid period of the issued Message and/or if observed rainfall reasonably met the QPF during the valid period. Conversely a miss was assigned if neither of these two criteria were met. Values were then populated for each forecast zone and all zones combined. Forecast accuracy was then calculated by month and season total.

Lead Time:

Lead time was calculated for each issued Message when possible. Time was measured from Message issuance to the first ALERT alarm triggered (rain, stream, or impoundment).

Tables containing all of the raw data used in generating the verification metrics discussed above for the MSP Messages can be found in [Appendix B](#).

LAKE ALERTS:

Forecast Accuracy:

A hit was assigned if any of the following observations occurred during the valid period of the issued Lake Alert: lightning within the recreational area boundary, wind > 30mph, or hail/heavy rain. Conversely a miss was assigned if none of these three criteria were observed. Values were then populated for each recreational zone and all zones combined. Forecast accuracy was then calculated by month and season total.

Lead Time:

Lead time was calculated for each issued Lake Alert when possible. Time was measured from the Lake Alert issuance to the first observation (lightning within the recreational area boundary, wind > 30mph, or hail/heavy rain).

Tables containing all of the raw data used in generating the verification metrics discussed above for the MSP Lake Alerts can be found in [Appendix C](#).

QPF PEAK RAINFALL INTENSITY:

Forecast Accuracy:

Only message statements where QPF peak rainfall intensity was provided were evaluated. Observational data used for this verification included Maricopa County ALERT rain gages and/or local storm reports. Either a hit or a miss was selected for each event. A hit was assigned if the percent error was less than or equal to 25%. Conversely a miss was assigned if the percent error was greater than 25%. Values were then populated for each forecast zone and all zones combined. Forecast accuracy was then calculated by month and season.

Tables containing all of the raw data used in generating the verification metrics discussed above for the MSP Messages can be found in [Appendix D](#).

STORM TOTAL PRECIPITATION:

Forecast Accuracy:

Only message statements where a QPF storm total precipitation amount was provided were evaluated. Observational data used for this verification included Maricopa County ALERT rain gages, local storm reports, and/or radar GAQPE. Either a hit or a miss was selected for each qualifying event. A hit was assigned if the percent error was less than or equal to 25%. Conversely a miss was assigned if the percent error was greater than 25%. Values were then populated for each forecast zone and all zones combined. Forecast accuracy was then calculated by month and season.

Tables containing all of the raw data used in generating the verification metrics discussed above for the MSP Messages can be found in [Appendix E](#).

OUTLOOK VERIFICATION

Table 3, below, shows the Outlook verification seasonal totals for each Forecast Zone (FZ). Complete data tables for each FZ, separated by month, can be viewed in [Appendix A: Table A-1](#). Overall, Outlook forecast accuracy during the length of the monsoon season for all FZs combined was quite good at 74.8%. Lower Salt River Lakes was the only FZ where the forecast accuracy fell below 75% on the season but it remained well above the 50% threshold. This was somewhat expected given the forecast challenges associated with predicting storm potential and rainfall output over this mainly high terrain region. Over-forecasting rain totals was a noticeable reason as to the lower accuracy and was easily visible when comparing with the false alarm rate, discussed below.

TABLE 3: MSP Weather Outlook Verification - SEASON TOTALS, 2015							
Forecast Zone	Accurate Forecasts	AOF (%)	Sig. Events Detected	POD (%)	False Alarms	FAR (%)	TS (%)
Gila Bend	84/108	77.8%	11/24	45.8%	2	1.9%	72.0%
Palo Verde	87/108	80.6%	5/14	35.7%	3	2.8%	74.5%
Rainbow Valley	84/108	77.8%	3/11	27.3%	2	1.9%	72.0%
West Valley	86/108	79.6%	7/12	58.3%	1	0.9%	75.0%
Northwest Valley	86/108	79.6%	7/13	53.8%	2	1.9%	74.2%
Upper Centennial	87/108	80.6%	14/22	64.0%	1	0.9%	76.1%
Wickenburg	92/108	85.2%	10/14	71.4%	3	2.8%	79.8%
New River/Cave Creek	85/108	78.7%	11/16	68.8%	3	2.8%	72.3%
Sycamore Creek	81/108	75.0%	5/9	55.6%	5	4.6%	66.7%
Phoenix North	83/108	76.9%	4/7	57.1%	5	4.6%	68.8%
Phoenix South	94/108	87.0%	11/14	78.6%	1	0.9%	83.7%
Scottsdale North	86/108	79.6%	5/8	62.5%	4	3.7%	72.6%
Scottsdale South	84/108	77.8%	7/9	78.0%	3	2.8%	71.3%
Southeast Valley	87/108	80.6%	9/12	75.0%	4	3.7%	73.7%
Lower Salt River Lakes	78/108	72.2%	6/8	75.0%	4	3.7%	64.2%
Superstition	87/108	80.6%	7/9	77.8%	5	4.6%	72.9%
All Zones	1293/1728	74.8%	122/202	60.3%	48/1728	2.8%	67.9%

The next metric computed was probability of detection. This metric was quite important because it distinguished how well MSP forecasters detected operationally significant events. Operationally significant events were defined as having 0.50" of rainfall or more. The POD during the length of the monsoon season for all FZs combined was 60.3%. In general, a POD of over 50% is considered sufficient and over 75% excellent in the forecast community. Thirteen FZs were above the 50% accuracy threshold with five meeting or exceeding the 75% accuracy threshold.

The next metric included in Table 3 was False Alarm Rate (FAR). It is important to keep track of how often MSP forecasters predicted an operationally significant flooding day that did not occur. Too many false alarms can degrade user confidence in the forecasts. In general a FAR below 50% is sufficient and below 25% is considered excellent within the forecast community. The overall FAR for all zones during the length of the monsoon season was exceptionally low at 2.8% with none of the forecast zones exceeding 4.6%.

The final metric included in Table 2 was Threat Score (TS). The monsoon season officially runs from June 15th through September 30th of each year, yet the operational season (active weather days) tends to be much shorter beginning sometime in early July and finishing by mid-September. TS is thought to serve as a better metric for overall forecast skill as it removes correct negatives that are not important when computing forecast accuracy i.e. dry days before and after the active monsoon season. This year the operational monsoon season began on June 23rd and ended on September 22nd. Overall, forecast skill was 67.9% for all FZs over the length of the active season. Only four FZs (West Valley, Upper Centennial, Wickenburg, and Phoenix South) met or exceeded the 75% accuracy threshold, while the remaining twelve FZs remained above the 50% threshold. Lower Salt River Lakes had the lowest TS at 64.2%.

MESSAGE VERIFICATION

The MSP messages carry a higher priority threat-wise than the daily outlooks. These statements (Alerts, Watches, and Warnings) serve as the most critical products issued by the MSP during the monsoon season to our clients. A high level of accuracy is required when forecasting these types of events as the information they provide is directly applicable to the potential or imminent flooding situation. All of the messages issued fall under the category of operationally significant events.

Table 4, on the next page, shows the issued message verification broken down by FZ and month. Complete data tables for each FZ can be viewed in [Appendix B](#): Tables B-1, B-2, and B-3. There were 118 qualifying messages issued over the length of the season. Forecast accuracy for all FZs combined, over the length of the season, was quite good at 75.4%. Ten of the sixteen FZs met or exceeded the 75% accuracy threshold with five of the other six at or above the 50% accuracy threshold. As stated earlier, 50% accuracy is considered sufficient and 75% or above is considered excellent within the forecast community. The Sycamore Creek FZ fell below the 50% threshold at 0%. Only two message statements were issued for the zone and were both missed watches.

Three messages were issued in June with an earlier than usual start to the operational monsoon season and all three verified. July was the busiest month with forty-four messages issued across six operationally significant days. It's worth noting however, that all but six of the messages issued as a result to the July 18th and 31st events. Overall, forecast accuracy for the month for all FZs combined was 72.7%. Nine of the twelve total misses for the month were a result of a Flash Flood Watch being issued for the entire County for July 18th. This event only brought heavy rains and flooding to the County's western FZs.

Thirty-one messages were issued in August spread out across six operational significant days. Forecast accuracy for the month across all FZs combined increased dramatically to 93.5%. The only two misses for the month came during the August 11th event. The rain events during August tended to be localized with no one event affecting more than seven FZs. No messages were issued for Gila Bend, Palo Verde, Upper Centennial, or Sycamore Creek.

September saw a sharp decrease in overall forecast accuracy to 62.5%. There were seven operationally significant days that spanned the length of the month. Twenty-three of the forty messages were issued as a result to the September 22nd event. Flash Flood Watches were issued for all sixteen FZs. Nine ended up being misses due to heavy rain and flooding remaining across the eastern zones.

Lead time was a new metric included for message statement verification this year. The average lead time (not shown) for all M-1 Alerts and M-3 Flash Flood Warnings combined over the length of the Monsoon season was just over 33 minutes. The average lead time for M-2 Flash Flood Watches was just over 27 hours.

TABLE 4: MSP Issued Statements Verification, broken down by month and Forecast Zone - Monsoon Season 2015

	June		July		August		September		Season Totals	
Forecast Zone	Correct Statements	AOF (%)	Correct Statements	AOF (%)	Correct Statements	AOF (%)	Correct Statements	AOF (%)	Correct Statements	AOF (%)
Gila Bend	0/0	n/a	2/3	66.7%	0/0	n/a	3/3	100%	5/6	83.3%
Palo Verde	0/0	n/a	3/3	100%	0/0	n/a	2/3	66.7%	5/6	83.3%
Rainbow Valley	0/0	n/a	4/4	100%	2/2	100%	1/2	50%	7/8	87.5%
West Valley	0/0	n/a	4/4	100%	2/2	100%	1/3	33.3%	7/9	77.8%
Northwest Valley	0/0	n/a	5/5	100%	2/2	100%	1/2	50%	8/9	88.9%
Upper Centennial	1/1	n/a	2/2	100%	0/0	n/a	1/2	50%	4/5	80%
Wickenburg	2/2	100%	6/6	100%	1/1	100%	1/3	33.3%	10/12	83.3%
New River/Cave Creek	0/0	n/a	0/1	0%	2/2	100%	0/1	0%	2/4	50%
Sycamore Creek	0/0	n/a	0/1	0%	0/0	n/a	0/1	0%	0/2	0%
Phoenix North	0/0	n/a	0/2	0%	2/2	100%	2/3	66.7%	4/7	57.1%
Phoenix South	0/0	n/a	1/2	50%	5/6	83.3%	3/5	60%	9/13	69.2%
Scottsdale North	0/0	n/a	1/2	50%	2/2	100%	2/3	66.7%	5/7	71.4%
Scottsdale South	0/0	n/a	1/2	50%	2/3	66.7%	3/3	100%	6/8	75%
Southeast Valley	0/0	n/a	1/3	33.3%	6/6	100%	3/3	100%	10/12	83.3%
Lower Salt River Lakes	0/0	n/a	1/2	50%	1/1	100%	0/1	0%	2/4	50%
Superstition	0/0	n/a	1/2	50%	2/2	100%	2/2	100%	5/6	83.3%
All Zones	3/3	100%	32/44	72.7%	29/31	93.5%	25/40	62.5%	89/118	75.4%

LAKE ALERT VERIFICATION

Weather guidance is provided to Maricopa County lakes/reservoirs and the recreational zones which encompass them in the form of lake alerts. These statements are issued as needed to inform staff/personnel of approaching adverse weather conditions with an emphasis on wind gusts and lightning activity and then to a lesser degree hail/heavy rainfall. A high level of accuracy is required when forecasting these types of events as lake alerts are considered warnings to the recreational community (staff, boaters, hikers, and campers).

Table 5, below, shows the issued lake alert verification broken down by recreational zone and month. Complete data tables for each recreational zone can be viewed in [Appendix C](#): Table C-1. There were 40 lake alerts issued over the length of the season with nearly half of the events occurring in August (19 of 40). No statements were issued for the Horseshoe Lake recreational zone after June due to a lack of water in the reservoir. Forecast accuracy for all recreational zones combined, over the length of the season, was 95%. All six of the zones easily exceeded the 75% accuracy threshold with the lowest forecast accuracy of 83.3% recorded at Lake Pleasant. As stated earlier, 50% accuracy is considered sufficient and 75% and above is considered excellent within the forecast community. The average lead time (not shown) for all lakes/reservoirs combined over the length of the Monsoon season was just under 16 minutes. Lead time was increased nearly 4 minutes from last year and forecast accuracy surpassed each of the previous two years.

TABLE 5: MSP Lake Alerts Issued - 2015 Monsoon Season

Recreational Zone	June		July		August		September		Season Totals	
	Correct Alerts	AOF (%)	Correct Alerts	AOF (%)	Correct Alerts	AOF (%)	Correct Alerts	AOF (%)	Correct Alerts	AOF (%)
Lake Pleasant	0/0	100%	1/2	50%	3/3	100%	1/1	100%	5/6	83.3%
Horseshoe Lake	1/1	100%	0/0	n/a	0/0	n/a	0/0	n/a	1/1	100%
Bartlett Lake	2/2	100%	1/1	100%	6/6	100%	2/2	100%	11/11	100%
Saguaro Lake	1/1	100%	2/2	100%	2/3	66.7%	1/1	100%	6/7	85.7%
Canyon Lake	1/1	100%	2/2	100%	4/4	100%	1/1	100%	8/8	100%
Apache Lake	1/1	100%	2/2	100%	3/3	100%	1/1	100%	7/7	100%
All Zones	6/6	100%	8/9	88.8%	18/19	94.7%	6/6	100%	38/40	95%

QPF PEAK RAINFALL INTENSITY VERIFICATION

The MSP has recently placed added emphasis on including QPF information within message statements, specifically M-1 Alerts. These messages are normally issued before the onset of rain events and precede warning issuance in order to maximize lead time for affected locations. Providing rainfall intensity that will likely accompany thunderstorms moving through a FZ is intended to help clients make well-informed and proactive decisions.

Figure 5, below, is a scatter plot depicting forecast versus observed rainfall intensity for all qualifying events during the length of the monsoon season. An accurate forecast will have points on or near the solid black diagonal line. Two black dashed lines were also included that show the “+/-” 25 percent error thresholds used in the verification process (discussed in the [MSP Verification Metrics and Criteria](#) section). All events that fall between the upper and lower thresholds were considered hits. These plots are commonly used within the forecast community to visually inspect how well forecast values correspond to the observed values. There were only sixteen qualifying message events that counted towards the verification of the QPF peak rainfall intensity and eleven events fell within the error threshold.

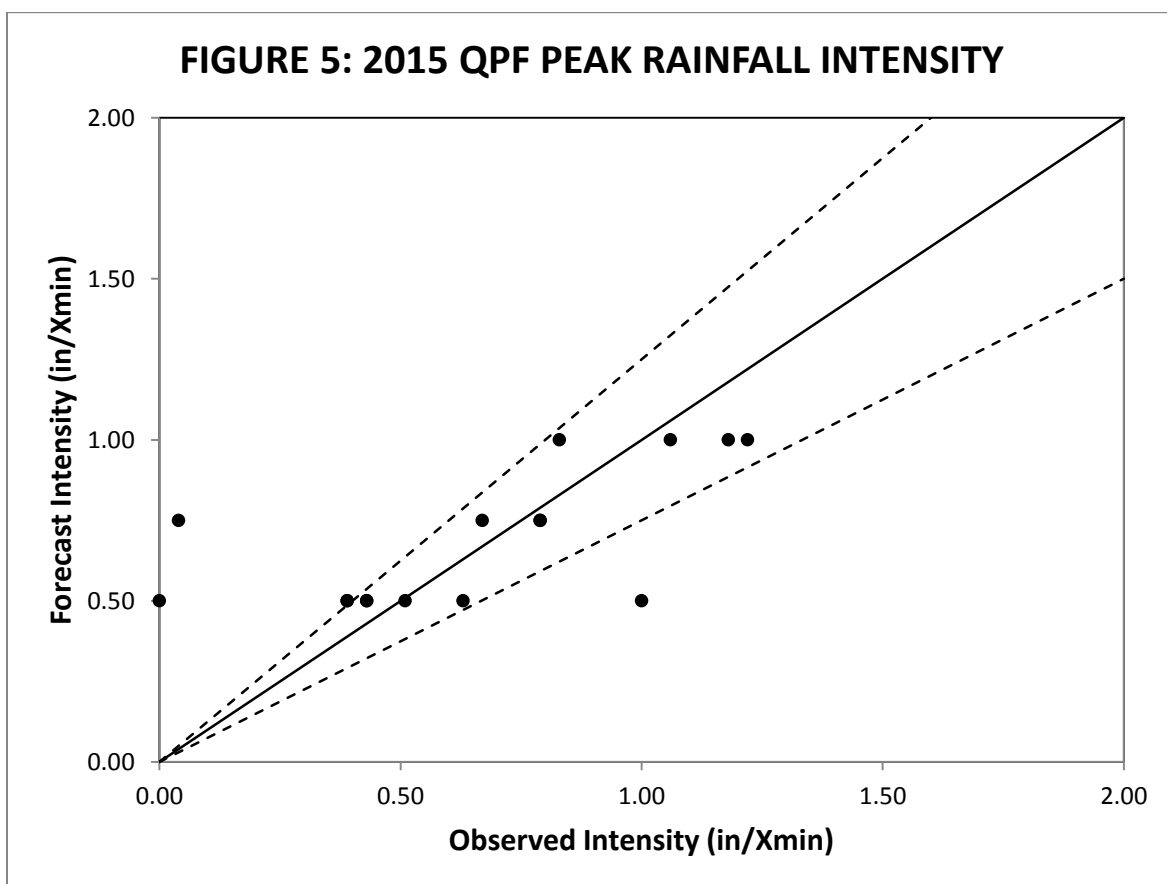


Table 6, below, shows the issued message verification broken down by FZ and month. Complete data tables for each FZ can be viewed in [Appendix D](#): Table D-1. Forecast accuracy for all FZs combined, over the length of the season, was 68.8%. July was the month with the lowest forecast skill and this was directly attributable to the over forecasting of rainfall rates spanning the two main operationally significant days during the month (18th and 31st). All five misses came during these two events. Only a handful of qualifying events occurred during the length of the season and the majority of them were during July, therefore a month to month comparison of changing forecast skill is not relevant.

TABLE 6: QPF Peak Rainfall Intensity Verification - Monsoon Season 2015										
	June		July		August		September		Season Totals	
Forecast Zone	Correct QPF	AOF (%)	Correct QPF	AOF (%)	Correct QPF	AOF (%)	Correct QPF	AOF (%)	Correct QPF	AOF (%)
Gila Bend	0/0	n/a	0/1	0%	0/0	n/a	0/0	n/a	0/1	0%
Palo Verde	0/0	n/a	0/1	0%	0/0	n/a	1/1	100%	1/2	50%
Rainbow Valley	0/0	n/a	1/1	100%	0/0	n/a	0/0	n/a	1/1	100%
West Valley	0/0	n/a	1/1	100%	0/0	n/a	0/0	n/a	1/1	100%
NW Valley	0/0	n/a	2/2	100%	0/0	n/a	0/0	n/a	2/2	100%
Upper Centennial	0/0	n/a	0/0	n/a	0/0	n/a	0/0	n/a	0/0	0%
Wickenburg	0/0	n/a	1/1	100%	0/0	n/a	0/0	n/a	1/1	100%
New River/Cave Creek	0/0	n/a	0/0	n/a	0/0	n/a	0/0	n/a	0/0	n/a
Sycamore Creek	0/0	n/a	0/0	n/a	0/0	n/a	0/0	n/a	0/0	n/a
Phoenix North	0/0	n/a	0/1	0%	0/0	n/a	0/0	n/a	0/1	0%
Phoenix South	0/0	n/a	1/1	100%	0/0	n/a	1/1	100%	2/2	100%
Scottsdale North	0/0	n/a	1/1	100%	0/0	n/a	0/0	n/a	1/1	100%
Scottsdale South	0/0	n/a	0/1	0%	0/0	n/a	0/0	n/a	0/1	0%
Southeast Valley	0/0	n/a	0/1	0%	0/0	n/a	0/0	n/a	0/1	0%
Lower Salt River Lakes	0/0	n/a	0/0	n/a	0/0	n/a	0/0	n/a	0/0	n/a
Superstition	0/0	n/a	1/1	100%	0/0	n/a	1/1	100%	2/2	100%
All Zones	0/0	n/a	8/13	61.5%	0/0	n/a	3/3	100%	11/16	68.8%

It is important to remember observed rainfall intensity data is typically gathered from either ALERT rain gages or provided from local storm reports. In either case, accurate measurements of peak rainfall intensity are contingent upon a thunderstorm rain core directly passing over a gage site. Often times the main rain core will move in between or only partially clip a gage site. This can be a noteworthy source of error especially over FZs with greater spatial gaps in between gage sites. New this year, gage adjusted radar estimates were used to reconstruct rainfall intensity when/where available.

QPF STORM TOTAL PRECIPITATION VERIFICATION

The MSP has recently placed added emphasis on including QPF information within message statements, specifically M-1 Alerts. These messages are normally issued before the onset of rain events and precede warning issuance in order to maximize lead time for affected locations. Providing STP that will likely accompany thunderstorms moving through a FZ is intended to help clients make well-informed and proactive decisions.

Figure 6, below, is a scatter plot depicting forecast versus observed storm total precipitation. An accurate forecast will have points on or near the solid black diagonal line. Two black dashed lines were also included that show the “+/-” 25 percent error thresholds used in the verification process (discussed in the [MSP Verification Metrics and Criteria](#) section). All events that fall between the upper and lower thresholds were considered hits. There were fifty-six qualifying message events that counted towards the verification of the STP forecasts and forty-six events fell within the error threshold.

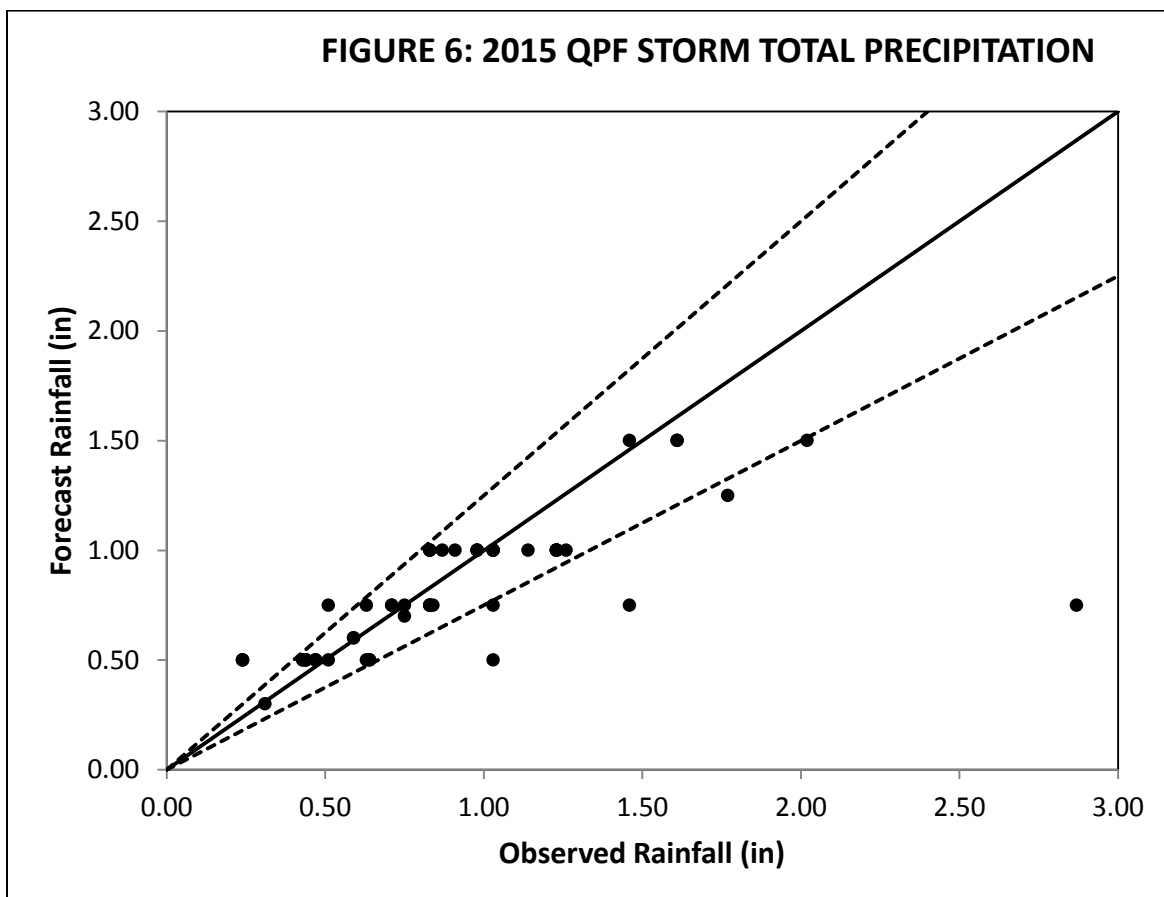


Figure 6 clearly shows that the majority of missed events over the course of the monsoon season tended to be under-forecast (observed rainfall value > forecast rainfall value) by the MSP. Table 7, on the next page, shows the issued message verification broken down by FZ and month. Complete data tables for each FZ can be viewed in [Appendix E](#): Table E-1.

Forecast accuracy for all FZs combined, over the length of the season, was 82.1%. Both qualifying STP events were correctly forecast in June. Accuracy in July came in at 72.7% before significantly improving in August to 93.1%. August also happened to have the largest number of qualifying STP events, more than double of any other month, at twenty-nine. Forecast Accuracy worsened in September coming in at 64.3%. Three of the five misses for the month came during the September 13th rain event.

The end of the previous section covered possible sources of error in peak rainfall intensity due to spatial gaps in reporting gages within certain FZs. In this case, observed storm total precipitation data was gathered from ALERT rain gages, local storm reports, and gage adjusted radar rainfall estimation (e.g. GAQPE). Radar rainfall estimates were able to fill in the gaps that would otherwise be missed in the aforementioned FZs. Forecast accuracy over the length of the monsoon season for all of the high terrain FZs (Upper Centennial, Wickenburg, New River/Cave Creek, Sycamore Creek, Lower Salt River Lakes, and Superstition) was exceptional at 90.9% (10/11, correct STP-QPFs).

TABLE 7: QPF Storm Total Precipitation Verification - Monsoon Season 2015

	June		July		August		September		Season Totals	
Forecast Zone	Correct QPF	AOF (%)	Correct QPF	AOF (%)	Correct QPF	AOF (%)	Correct QPF	AOF (%)	Correct QPF	AOF (%)
Gila Bend	0/0	n/a	0/1	0%	0/0	n/a	1/1	100%	1/2	50%
Palo Verde	0/0	n/a	1/1	100%	0/0	n/a	1/1	100%	2/2	100%
Rainbow Valley	0/0	n/a	2/2	100%	0/1	0%	0/1	0%	2/4	50%
West Valley	0/0	n/a	2/2	100%	1/1	100%	1/2	50%	4/5	80%
NW Valley	0/0	n/a	2/2	100%	3/3	100%	0/1	0%	5/6	83.3%
Upper Centennial	1/1	100%	0/0	n/a	0/0	n/a	0/0	n/a	1/1	100%
Wickenburg	1/1	100%	0/1	0%	1/1	100%	1/1	100%	3/4	75%
New River/Cave Creek	0/0	n/a	0/0	n/a	2/2	100%	0/0	n/a	2/2	100%
Sycamore Creek	0/0	n/a	0/0	n/a	0/0	n/a	0/0	n/a	0/0	n/a
Phoenix North	0/0	n/a	0/0	n/a	2/2	100%	2/2	100%	4/4	100%
Phoenix South	0/0	n/a	0/0	n/a	4/5	80%	1/2	50%	5/7	71.4%
Scottsdale North	0/0	n/a	0/0	n/a	2/2	100%	1/1	100%	3/3	100%
Scottsdale South	0/0	n/a	0/0	n/a	3/3	100%	1/1	100%	4/4	100%
Southeast Valley	0/0	n/a	0/1	0%	6/6	100%	0/1	0%	6/8	75%
Lower Salt River Lakes	0/0	n/a	1/1	100%	1/1	100%	0/0	n/a	2/2	100%
Superstition	0/0	n/a	0/0	n/a	2/2	100%	0/0	n/a	2/2	100%
All Zones	2/2	100%	8/11	72.7%	27/29	93.1%	9/14	64.3%	46/56	82.1%

SUMMARY

The Flood Warning Branch of the FCDMC operates a year round Meteorological Services Program (MSP) that's purpose is to provide detailed weather forecasts and support to county, city, and other local agencies encompassing Maricopa County and its contributing watersheds. In particular, during the length of the monsoon season, it is the specific the goal of the MSP to reduce response time for emergency managers by providing timely and accurate weather information, primarily regarding the potential for flood-producing rainfall. This report provides a compiled set of verification statistics based on products issued by the MSP during the length of the 2015 monsoon season. Outlooks, Messages, Lake Alerts, QPF Peak Intensity, and QPF Storm Total Precipitation were the five products analyzed in this report.

Verification of daily outlooks was conducted using four metrics: forecast accuracy, probability of detection, false alarm rate, and Threat Score. When comparing all forecast zones combined over the length of the monsoon season, forecast accuracy was 74.8%, probability of detection was 60.3%, the false alarm rate was 2.8%, and the Threat Score was 67.9%. False alarm rate fell into the "excellent" category when equating these results with accepted values within the forecast community while forecast accuracy and probability of detection remained well above the 50% threshold. Threat Score or a measure of forecast accuracy after removing non-important forecasts before and after the operational season came in below the 75% threshold for all FZs combined, but each zone remained well above the 50% threshold.

Verification of messages was conducted using forecast accuracy. When comparing all forecast zones combined over the length of the monsoon season, forecast accuracy was 75.4%. Any value of over 75% is considered "excellent" within the forecast community. Forecast skill was highest in August at 93.5%. A large portion of the degradation in forecast skill during July and September is a direct result of null events in FZs during Flash Flood Watches during these months. Lead time was added as a new metric included for message statement verification this year. The average lead time for all M-1 Alerts and M-3 Flash Flood Warnings combined over the length of the Monsoon season was just over 33 minutes. The average lead time for M-2 Flash Flood Watches was just over 27 hours.

Verification of lake alerts was conducted using forecast accuracy. When comparing all forecast zones combined over the length of the monsoon season, forecast accuracy was 95%. Any value over 75% is considered "excellent" within the forecast community. It's worth noting again that only one lake alert was issued for Horseshoe Lake this monsoon season as the reservoir remained mostly empty through the summer months.

Verification of QPF peak rainfall intensity was conducted using forecast accuracy. Forecast accuracy was determined using computed percent error when looking at forecasts versus observational data sets. When comparing all forecast zones combined over the length of the monsoon season, forecast accuracy was 68.8%.

Verification of QPF storm total precipitation was conducted using forecast accuracy. Forecast accuracy was determined using computed percent error when looking at forecasts versus observational data sets. When comparing all forecast zones combined over the length of the monsoon season, forecast accuracy was 82.1%. The addition of gage corrected radar rainfall estimation and cooperative rain gage sites in the verification process has proved to be critical for FZs with greater spatial gaps between gage sites.

TABLE 8: Historic Monsoon Season Verification Comparison

	Outlooks				Messages		Lake Alerts		QPF Intensity		QPF STP	
Year	AOF	POD	FAR	TS	Events	AOF	Events	AOF	Events	AOF	Events	AOF
2012	79.1%	79.6%	8.9%	n/a	102	86.3%	n/a	n/a	n/a	n/a	n/a	n/a
2013	79.8%	78.7%	6.2%	n/a	137	88.0%	56	89.3%	69	58.0%	54	72.2%
2014	77.7%	76.9%	7.1%	67.4%	263	80.2%	57	84.2%	118	57.6%	76	72.4%
2015	74.8%	60.3%	2.8%	67.9%	118	75.4%	40	95%	16	68.8%	56	82.1%

Table 8, above, was included to add more historical perspective in the verification process. Verification metrics for Outlooks, Messages, Lake Alerts, and QPF products were included for all previous years. When comparing to previous years' Outlook verification, forecast accuracy in 2015 was lower by 2.9% than in 2014 and 5.0% than in 2013. Probability of detection was much lower than previous years though false alarm also decreased largely. This data directly shows the cost of conservatism in daily Outlook forecasts in order to reduce false alarm rate. Threat score remained nearly identical from last year.

Forecast skill for issued messages dropped from the previous three years but remained above the 75% threshold. The main reason for this drop, discussed in the messages verification section, was due to missed zones (false alarms) during Flash Flood Watches. Forecast accuracy for Lake Alerts rose significantly by 10.8% from 2014 and 5.7% when compared to 2013. QPF intensity and storm total precipitation products both jumped significantly, by around 10%, from any previous year. A reason for this increased accuracy was directly attributable to improved skill from the District's QPF program, which supplies hourly and sub-hourly rainfall information to forecasters.

When all was said and done, the 2015 monsoon season ended up being one of the drier seasons in recent memory especially in the shadow of 2014's historically wet season. A lower number of message statements were issued this season when compared with 2014 and 2013. It is hoped that this report serves as quantifiable tool used to evaluate forecast performance on a year to year basis. This report will be continued in subsequent years focusing not only the present year's statistical data, but will also serve as a historical comparison to measure future year's performance.

APPENDIX A: MSP OUTLOOKS - VERIFICATION TABLES

TABLE A-1: This table shows the raw verification data of MSP issued precipitation forecasts contained in the daily Outlooks for the 2015 monsoon season. The valid period for rainfall each day is from 2PM same day through 12PM the following day. The table is broken down by date and MSP Forecast Zone. For brevity two Forecast Zones are included for each day. The columns from left to right are defined as follows:

Prob. – Percent probability of measureable rain within the Forecast Zone from 0% to 100% over the period.

QPF – Total forecast rainfall in inches within the Forecast Zone over the period.

ALERT – Peak total observed ALERT gage rainfall value in inches within the Forecast Zone over the period.

GAQPE – Radar rainfall estimate (see [Verification Metrics and Criteria](#) section for more details).

AOF – Forecast accuracy, assigned an “h” for a hit and “m” for a miss.

POD – Probability of detection, assigned an “h” for a hit, “m” for a miss, or “-” for non-significant rainfall.

FA – False alarms, assigned an “x”.

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
	GILA BEND							PALO VERDE						
06/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/26/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
06/27/14	30	0.40	0.16	0.25-0.43	h	-	-	20	0.20	0.00	0.04-0.24	h	-	-
06/28/14	40	0.40	0.12	1.23-1.61	m	m	-	30	0.30	0.04	0.84-1.02	m	m	-
06/29/14	10	0.10	0.00	0.04-0.24	h	-	-	0	0.00	0.12	0.64-0.83	m	m	-
06/30/14	40	0.50	0.16	0.84-1.02	h	h	-	30	0.40	0.00	0.64-0.83	h	m	-
16 days					15/16*	1/2*	0					14/16*	0/3*	0
07/01/14	20	0.25	0.08	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/02/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
07/03/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.04	0.04-0.24	m	-	-
07/04/14	10	0.33	0.04	0.25-0.43	h	-	-	10	0.33	0.00	0.00	h	-	-
07/05/14	20	0.33	0.00	1.03-1.22	m	m	-	20	0.33	1.14	1.62-1.81	m	m	-
07/06/14	20	0.25	0.16	1.23-1.61	m	m	-	0	0.00	0.12	0.84-1.02	m	m	-
07/07/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/08/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
07/09/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/10/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/12/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/13/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
07/14/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/15/14	0	0.00	0.00	1.62-1.81	m	m	-	0	0.00	0.00	0.00	h	-	-
07/16/14	20	0.30	0.00	1.62-1.81	m	m	-	0	0.00	0.00	0.00	h	-	-
07/17/14	60	1.25	0.24	1.62-1.81	h	h	-	60	1.25	0.08	2.41-2.60	h	h	-
07/18/14	60	1.25	0.16	2.02-2.20	h	h	-	60	1.00	0.39	0.44-0.63	h	h	-
07/19/14	30	1.25	0.00	0.84-1.02	h	h	-	30	1.25	0.00	0.00	m	-	x
07/20/12	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/23/14	0	0.00	0.00	0.44-0.63	m	-	-	0	0.00	0.00	0.00	h	-	-
07/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
07/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/28/14	10	0.25	0.35	1.03-1.22	m	m	-	0	0.00	0.00	0.00	h	-	-
07/29/14	50	0.50	0.00	0.00	m	-	x	40	0.50	0.00	0.00	m	-	-
07/30/14	30	0.40	0.00	0.44-0.63	h	-	-	20	0.25	0.00	0.00	m	-	-
07/31/14	50	0.75	0.16	0.44-0.63	h	h	-	40	0.75	0.00	0.04-0.24	m	-	x
31 days					24/31*	4/9*	1					24/31*	2/4*	2
08/01/14	30	0.75	0.00	0.00	m	-	-	30	0.75	0.00	0.00	m	-	-
08/02/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/03/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/04/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/05/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
08/06/14	30	0.75	0.00	0.04-0.24	m	-	-	30	0.50	0.00	0.00	m	-	-
08/07/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
08/08/14	0	0.00	0.04	0.64-0.83	m	m	-	0	0.00	0.00	0.00	h	-	-
08/09/14	30	0.25	0.00	0.00	m	-	-	0	0.00	0.00	0.00	h	-	-
08/10/14	20	0.50	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/11/14	40	1.25	0.00	0.64-0.83	h	h	-	30	1.00	0.08	0.25-0.43	m	-	x
08/12/14	40	1.00	0.00	2.21-2.40	m	h	-	30	0.75	0.12	0.44-0.63	h	h	-
08/13/14	10	0.25	0.00	0.04-0.24	h	-	-	10	0.25	0.00	0.00	h	-	-
08/14/14	10	0.33	0.04	0.84-1.02	m	m	-	0	0.00	0.67	0.64-0.83	m	m	-
08/15/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
08/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/21/14	0	0.00	0.00	1.03-1.22	m	m	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
08/22/14	10	0.25	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
08/23/14	20	0.25	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
08/24/14	30	1.00	0.00	0.25-0.43	m	-	x	30	0.50	0.20	0.25-0.43	h	-	-
08/25/14	10	0.25	0.08	0.04-0.24	h	-	-	10	0.25	0.08	0.04-0.24	h	-	-
08/26/14	10	0.25	0.00	0.44-0.63	h	-	-	0	0.00	0.00	0.00	h	-	-
08/27/14	20	0.50	0.00	1.03-1.22	h	h	-	20	0.25	0.04	1.23-1.61	m	m	-
08/28/14	0	0.00	0.00	0.44-0.63	m	-	-	0	0.00	0.00	0.00	h	-	-
08/29/14	20	0.33	0.16	1.23-1.61	m	m	-	20	0.33	0.00	1.62-1.81	m	-	-
08/30/14	10	0.33	0.00	0.84-1.02	m	m	-	10	0.33	0.00	0.00	h	-	-
08/31/14	30	0.50	0.00	0.25-0.43	h	-	-	10	0.25	0.00	0.00	h	-	-
31 days					20/31*	3/8*	1					25/31*	1/3*	1
09/01/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/02/14	10	0.35	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/03/14	20	0.25	0.20	0.44-0.63	h	-	-	20	0.25	0.12	0.64-0.83	m	m	-
09/04/14	0	0.00	0.16	0.25-0.43	m	-	-	0	0.00	0.24	0.84-1.02	m	m	-
09/05/14	30	0.35	0.04	0.25-0.43	h	-	-	20	0.35	0.04	0.25-0.43	h	-	-
09/06/14	10	0.10	0.00	0.25-0.43	h	-	-	10	0.10	0.00	0.00	h	-	-
09/07/14	10	0.25	0.00	0.64-0.83	m	m	-	0	0.00	0.04	0.04-0.24	m	-	-
09/08/14	30	0.50	0.00	0.00	m	-	-	30	0.35	0.00	0.00	m	-	-
09/09/14	20	0.10	0.00	0.04-0.24	h	-	-	10	t	0.00	0.04-0.24	h	-	-
09/10/14	20	0.50	0.00	0.04-0.24	h	-	-	10	t	0.00	0.00	h	-	-
09/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/12/14	0	0.00	0.00	1.03-1.22	m	m	-	0	0.00	0.04	0.04-0.24	m	-	-
09/13/14	40	0.75	0.12	1.62-1.81	m	h	-	30	0.50	0.08	1.23-1.61	m	h	-
09/14/14	20	0.25	0.00	0.44-0.63	h	-	-	20	0.25	0.00	0.25-0.43	h	-	-
09/15/14	0	0.00	0.00	0.04-0.24	h	-	-	10	0.10	0.00	0.00	h	-	-
09/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/17/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
09/18/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
09/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/20/14	40	0.10	0.08	0.25-0.43	h	-	-	30	0.10	0.04	0.04-0.24	h	-	-
09/21/14	90	0.50	0.51	0.64-0.83	h	h	-	90	0.50	0.24	0.25-0.43	h	-	-
09/22/14	50	0.67	0.39	1.62-1.81	h	h	-	40	0.67	0.12	0.64-0.83	h	h	-
09/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/29/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/30/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
30 days					25/30*	3/5*	0					24/30*	2/4*	0
	Rainbow Valley							West Valley						
06/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/26/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
06/27/14	30	0.30	0.08	0.04-0.24	h	-	-	20	0.10	0.00	0.00	h	-	-
06/28/14	40	0.30	0.00	0.00	m	-	-	30	0.20	0.00	0.00	m	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
06/29/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.28	0.25-0.43	m	-	-
06/30/14	30	0.30	0.04	0.04-0.24	h	-	-	20	0.30	0.00	0.04-0.24	h	-	-
16 days					15/16*	0	0					14/16*	0	0
07/01/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/02/14	0	0.00	0.20	0.25-0.43	m	-	-	0	0.00	0.28	1.23-1.61	m	m	-
07/03/14	0	0.00	0.08	0.04-0.24	m	-	-	0	0.00	0.04	0.25-0.43	m	-	-
07/04/14	10	0.33	0.00	0.00	h	-	-	10	0.33	0.00	0.00	h	-	-
07/05/14	10	0.33	0.63	1.23-1.61	m	m	-	10	0.33	0.83	1.62-1.81	m	-	-
07/06/14	0	0.00	0.08	0.64-0.83	m	-	-	0	0.00	0.00	0.00	h	-	-
07/07/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
07/08/14	0	0.00	0.08	0.04-0.24	m	-	-	0	0.00	0.08	0.04-0.24	h	-	-
07/09/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/10/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/12/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/13/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/14/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/15/14	0	0.00	0.00	1.03-1.22	m	m	-	0	0.00	0.00	0.00	h	-	-
07/16/14	10	0.20	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/17/14	60	1.00	0.00	0.00	m	-	x	50	0.75	0.00	0.44-0.63	h	h	-
07/18/14	60	1.00	0.63	0.64-0.83	h	h	-	50	1.00	0.47	1.23-1.61	h	h	-
07/19/14	20	1.25	0.00	0.00	m	-	-	20	1.25	0.00	0.00	m	-	-
07/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/23/14	0	0.00	0.00	0.84-1.02	m	m	-	0	0.00	0.00	0.00	h	-	-
07/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/25/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
07/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.28	0.25-0.43	m	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
Date	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
07/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/29/14	10	0.10	0.35	0.25-0.43	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
07/30/14	40	0.50	0.00	0.00	m	-	x	50	0.75	0.00	0.00	m	-	x
07/31/14	30	0.25	0.00	0.00	m	-	-	20	0.25	0.00	0.00	m	-	-
31 days	40	0.75	0.35	1.03-1.22	h	h	-	30	0.75	1.06	2.02-2.20	h	h	-
08/01/14					20/31*	2/5*	2					25/31*	3/4*	1
08/02/14	20	0.75	0.00	0.00	m	-	-	20	0.75	0.00	0.00	m	-	-
08/03/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/04/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/05/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/06/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/07/14	30	0.50	0.00	0.04-0.24	m	-	-	30	0.40	0.00	0.00	m	-	-
08/08/14	0	0.00	0.00	0.25-0.43	m	-	-	0	0.00	0.00	0.44-0.63	m	-	-
08/09/14	0	0.00	0.00	0.25-0.43	m	-	-	0	0.00	0.00	0.00	h	-	-
08/10/14	10	0.15	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/11/14	10	0.25	0.12	0.44-0.63	h	-	-	0	0.00	0.47	1.03-1.22	m	m	-
08/12/14	20	0.50	0.20	0.25-0.43	h	-	-	10	0.25	0.20	0.25-0.43	h	-	-
08/13/14	30	0.50	0.00	0.00	m	-	-	30	0.25	0.00	0.00	m	-	-
08/14/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/15/14	10	0.25	0.08	1.03-1.22	m	m	-	0	0.00	0.00	0.04-0.24	h	-	-
08/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
08/24/14	30	0.35	0.08	0.04-0.24	h	-	-	30	0.50	0.04	0.44-0.63	h	h	-
08/25/14	20	0.50	0.04	0.04-0.24	h	-	-	20	0.50	0.00	0.00	m	-	-
08/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/27/14	20	0.25	1.77	1.82-2.01	m	m	-	30	0.35	1.57	1.23-1.61	m	m	-
08/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/29/14	20	0.33	0.00	0.25-0.43	h	-	-	20	0.33	0.12	1.03-1.22	m	m	-
08/30/14	20	0.33	0.00	0.84-1.02	m	m	-	10	0.33	0.39	0.44-0.63	h	-	-
08/31/14	10	0.50	0.20	0.64-0.83	h	h	-	20	0.25	0.00	0.04-0.24	h	-	-
31 days					23/31*	1/4*	0					23/31*	1/4*	0
09/01/14	10	0.15	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/02/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/03/14	20	0.25	0.28	0.25-0.43	h	-	-	0	0.00	0.08	0.04-0.24	m	-	-
09/04/14	0	0.00	0.31	0.64-0.83	m	m	-	0	0.00	0.16	0.25-0.43	m	-	-
09/05/14	20	0.35	0.04	0.04-0.24	h	-	-	30	0.35	0.00	0.00	m	-	-
09/06/14	10	0.10	0.00	0.00	h	-	-	10	0.15	0.00	0.00	h	-	-
09/07/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.84-1.02	m	m	-
09/08/14	10	0.25	0.00	0.00	h	-	-	10	0.35	0.00	0.04-0.24	h	-	-
09/09/14	10	t	0.00	0.00	h	-	-	10	t	0.00	0.00	h	-	-
09/10/14	10	t	0.00	0.04-0.24	h	-	-	10	t	0.00	0.00	h	-	-
09/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/12/14	0	0.00	0.00	0.44-0.63	m	-	-	0	0.00	0.16	0.25-0.43	m	-	-
09/13/14	30	0.50	2.40	2.81-3.19	m	m	-	30	0.67	1.10	1.82-2.01	h	h	-
09/14/14	30	0.50	0.20	0.25-0.43	h	-	-	30	0.50	0.24	0.44-0.63	h	h	-
09/15/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/20/14	30	0.10	0.04	0.04-0.24	h	-	-	30	0.10	0.00	0.04-0.24	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
09/21/14	70	0.50	0.08	0.25-0.43	h	-	-	70	0.50	0.04	0.04-0.24	m	-	
09/22/14	40	0.67	0.00	0.04-0.24	m	-		40	0.67	0.16	0.84-1.02	h	h	-
09/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/29/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/30/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
30 days					26/30*	0/2*	0					24/30*	3/4*	0
	Northwest Valley							Upper Centennial						
06/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/26/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
06/27/14	20	0.20	0.00	0.04-0.24	h	-	-	20	0.20	0.00	0.04-0.24	h	-	-
06/28/14	30	0.20	0.00	0.00	m	-	-	20	0.20	0.35	0.64-0.83	h	-	-
06/29/14	10	0.10	0.24	0.25-0.43	m	-	-	20	0.10	0.51	0.64-0.83	m	m	-
06/30/14	30	0.40	0.04	0.25-0.43	h	-	-	40	0.75	0.08	0.64-0.83	h	h	

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
16 days					14/16*	0	0					15/16*	1/2*	0
07/01/14	20	0.25	0.00	0.00	m	-	-	20	0.25	0.00	0.00	m	-	-
07/02/14	0	0.00	0.00	0.25-0.43	m	-	-	0	0.00	0.28	0.84-1.02	m	m	-
07/03/14	20	0.25	0.08	0.04-0.24	h	-	-	20	0.25	0.63	1.03-1.22	m	m	-
07/04/14	20	0.50	0.00	0.00	m	-	-	20	0.50	0.00	0.04-0.24	m	-	-
07/05/14	0	0.00	0.28	0.64-0.83	m	m	-	20	0.50	0.83	2.61-2.80	m	m	-
07/06/14	0	0.00	0.75	1.62-1.81	m	m	-	10	0.15	0.12	0.44-0.63	h	-	-
07/07/14	10	0.10	0.00	0.04-0.24	h	-	-	10	0.10	0.00	0.44-0.63	m	-	-
07/08/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/09/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/10/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
07/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/12/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/13/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/14/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/17/14	60	1.00	0.16	0.44-0.63	h	h	-	60	1.25	0.79	2.61-2.80	h	h	-
07/18/14	60	1.25	0.87	1.23-1.61	h	h	-	60	1.50	0.28	2.21-2.40	h	h	-
07/19/14	20	1.50	0.00	0.00	m	-	-	30	1.75	0.16	1.82-2.01	h	h	-
07/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/28/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
07/29/14	50	1.00	0.00	0.00	m	-	x	50	1.00	0.00	0.00	m	-	x
07/30/14	30	0.50	0.00	0.00	m	-	-	30	0.60	0.83	1.03-1.22	h	h	-
07/31/14	30	0.75	0.24	1.03-1.22	h	h	-	40	1.00	0.94	1.82-2.01	h	h	-
31 days					23/31*	3/5*	1					24/31*	5/8*	1
08/01/14	20	0.75	0.00	0.00	m	-	-	20	0.75	0.00	0.00	m	-	-
08/02/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/03/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/04/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/05/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
08/06/14	30	0.40	0.00	0.00	m	-	-	30	0.50	0.20	0.44-0.63	h	h	-
08/07/14	0	0.00	0.67	0.44-0.63	m	m	-	0	0.00	0.00	0.25-0.43	m	-	-
08/08/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/09/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/10/14	0	0.00	0.59	0.64-0.83	m	m	-	0	0.00	0.00	0.04-0.24	h	-	-
08/11/14	10	0.25	0.28	0.44-0.63	h	-	-	10	0.25	0.20	0.25-0.43	h	-	-
08/12/14	30	0.25	0.00	0.00	m	-	-	30	0.75	0.00	0.04-0.24	m	-	
08/13/14	0	0.00	0.00	0.00	h	-	-	10	0.25	0.00	0.04-0.24	h	-	-
08/14/14	0	0.00	0.00	0.00	h	-	-	10	0.25	0.08	0.25-0.43	h	-	-
08/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/24/14	30	0.50	0.16	0.64-0.83	h	h	-	30	0.50	0.20	1.03-1.22	h	h	-
08/25/14	30	0.50	0.00	0.00	m	-	-	20	0.50	0.08	0.04-0.24	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
08/26/14	10	0.15	0.00	0.00	h	-	-	20	0.25	0.00	1.23-1.61	m	m	-
08/27/14	30	0.35	0.87	1.23-1.61	m	m	-	30	0.50	0.28	1.62-1.81	m	h	-
08/28/14	0	0.00	0.00	0.00	h	-	-	10	0.25	0.08	0.25-0.43	h	-	-
08/29/14	30	0.50	0.08	1.03-1.22	h	h	-	30	0.50	0.59	1.03-1.22	h	h	-
08/30/14	10	0.33	0.00	0.04-0.24	h	-	-	10	0.33	0.00	0.00	h	-	-
08/31/14	20	0.25	0.00	0.25-0.43	h	-	-	20	0.25	0.00	0.00	m	-	-
31 days					24/31*	2/5*	0					25/31*	4/5*	0
09/01/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/02/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/03/14	0	0.00	0.12	0.04-0.24	m	-	-	0	0.00	0.00	0.04-0.24	h	-	-
09/04/14	0	0.00	0.12	0.25-0.43	m	-	-	0	0.00	0.47	1.03-1.22	m	m	-
09/05/14	30	0.40	0.04	0.04-0.24	h	-	-	20	0.25	0.04	0.04-0.24	h	-	-
09/06/14	10	0.15	0.00	0.00	h	-	-	10	0.15	0.00	0.00	h	-	-
09/07/14	0	0.00	0.63	1.03-1.22	m	m	-	10	0.10	0.55	1.23-1.61	m	m	-
09/08/14	20	0.50	0.04	0.25-0.43	h	-	-	30	0.50	0.20	1.23-1.61	m	h	-
09/09/14	10	0.10	0.00	0.00	h	-	-	20	0.10	0.00	0.00	m	-	-
09/10/14	10	0.25	0.04	0.04-0.24	h	-	-	20	0.50	0.00	0.00	m	-	-
09/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/12/14	0	0.00	0.04	0.04-0.24	m	-	-	0	0.00	0.12	0.84-1.02	m	m	-
09/13/14	20	0.67	0.71	1.03-1.22	h	h	-	20	0.67	0.55	0.64-0.83	h	h	-
09/14/14	30	0.35	0.28	0.25-0.43	h	-	-	20	0.25	0.16	0.04-0.24	h	-	-
09/15/14	20	0.15	0.04	0.04-0.24	h	-	-	20	0.15	0.00	0.04-0.24	h	-	-
09/16/14	10	0.10	0.00	0.00	h	-	-	10	0.15	0.00	0.00	h	-	-
09/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/20/14	20	0.25	0.00	0.00	m	-	-	20	0.25	0.00	0.00	m	-	-
09/21/14	70	0.50	0.16	0.25-0.43	h	-	x	70	0.75	0.20	0.64-0.83	h	h	-
09/22/14	40	0.67	0.24	0.64-0.83	h	h	-	50	0.75	0.91	1.23-1.61	h	h	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
09/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/29/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/30/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
30 days					25/30*	2/3*	1					23/30*	4/7*	0
	Wickenburg							New River Cave Creek						
06/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/24/14	0	0.00	0.00	0.00	h	-	-	10	0.05	0.00	0.04-0.24	h	-	-
06/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
06/27/14	20	0.20	0.00	0.00	h	-	-	30	0.40	0.08	0.25-0.43	h	-	-
06/28/14	20	0.20	0.12	0.25-0.43	h	-	-	50	0.50	0.00	0.00	m	m	-
06/29/14	20	0.10	1.46	1.23-1.61	m	m	-	20	0.20	0.08	0.25-0.43	h	-	-
06/30/14	40	0.75	0.28	0.25-0.43	h	-	x	40	0.50	0.16	0.25-0.43	h	-	-
16 days					15/16*	0/1*	1					15/16*	0/1*	0
07/01/14	20	0.25	0.00	0.00	m	-	-	20	0.25	0.00	0.00	m	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
07/02/14	0	0.00	0.00	0.25-0.43	m	-	-	0	0.00	0.47	0.84-1.02	m	m	-
07/03/14	20	0.25	0.63	0.64-0.83	m	m	-	0	0.00	1.06	0.84-1.02	m	m	-
07/04/14	20	0.50	0.00	0.00	m	-	-	30	0.75	0.00	0.00	m	-	-
07/05/14	20	0.50	0.71	0.64-0.83	h	h	-	0	0.00	0.16	0.04-0.24	m	-	-
07/06/14	10	0.25	0.00	0.44-0.63	h	-	-	20	0.35	0.00	0.00	m	-	-
07/07/14	10	0.10	0.00	0.00	h	-	-	20	0.20	0.08	0.00	h	-	-
07/08/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/09/14	0	0.00	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
07/10/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.12	0.25-0.43	m	-	-
07/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/12/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/13/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/14/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/17/14	60	1.25	0.51	1.03-1.22	h	h	-	50	1.25	0.00	0.04-0.24	m	-	x
07/18/14	60	1.50	5.08	2.81+	m	h	-	50	1.25	0.24	0.25-0.43	m	-	x
07/19/14	30	1.75	0.04	1.03-1.22	h	h	-	10	2.00	0.67	0.64-0.83	h	h	-
07/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
07/29/14	50	1.00	0.00	0.00	m	-	x	40	1.25	0.28	0.64-0.83	h	h	-
07/30/14	30	0.75	0.00	0.00	m	-	-	30	0.75	0.55	0.44-0.63	h	h	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
07/31/14	40	1.00	1.50	2.02-2.20	h	h	-	50	1.25	0.35	1.23-1.61	h	h	-
31 days					24/31*	5/6*	1					22/31*	4/6*	2
08/01/14	20	0.75	0.00	0.00	m	-	-	20	0.75	0.00	0.25-0.43	h	-	-
08/02/14	10	0.10	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
08/03/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/04/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/05/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/06/14	30	0.50	0.00	0.00	m	-	-	30	0.25	0.00	0.00	m	-	-
08/07/14	0	0.00	0.00	0.25-0.43	m	-	-	10	0.25	0.43	0.44-0.63	h	-	-
08/08/14	0	0.00	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
08/09/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/10/14	0	0.00	1.10	1.03-1.22	m	m	-	20	0.50	0.47	0.64-0.83	h	h	-
08/11/14	10	0.25	0.39	0.25-0.43	h	-	-	10	0.35	0.24	0.25-0.43	h	-	-
08/12/14	30	0.75	0.00	0.00	m	-	-	20	0.25	0.04	0.00	m	-	-
08/13/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/14/14	10	0.25	0.04	0.04-0.24	h	-	-	0	0.00	0.00	0.25-0.43	m	-	-
08/15/14	0	0.00	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
08/16/14	0	0.00	0.00	0.00	h	-	-	10	0.33	0.00	0.04-0.24	h	-	-
08/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/23/14	0	0.00	0.00	0.25-0.43	m	-	-	30	0.25	0.31	1.03-1.22	m	m	-
08/24/14	40	0.75	0.75	0.64-0.83	h	h	-	40	0.75	0.75	0.84-1.02	h	h	-
08/25/14	20	0.50	0.08	0.04-0.24	m	-	-	30	0.75	0.04	0.04-0.24	m	-	-
08/26/14	20	0.25	0.00	0.00	m	-	-	20	0.25	0.00	0.04-0.24	h	-	-
08/27/14	30	0.50	0.04	0.84-1.02	h	h	-	30	0.50	0.12	0.44-0.63	h	h	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
08/28/14	10	0.25	0.63	0.44-0.63	m	m	-	10	0.33	0.24	0.44-0.63	h	-	-
08/29/14	30	0.50	0.12	0.04-0.24	m	-	-	30	0.67	0.00	0.25-0.43	h	-	-
08/30/14	10	0.33	0.00	0.00	h	-	-	20	0.50	0.12	0.44-0.63	h	h	-
08/31/14	20	0.25	0.00	0.00	m	-	-	30	0.75	1.06	1.03-1.22	h	h	-
31 days					30/31*	2/4*	0					26/31*	5/6*	0
09/01/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/02/14	0	0.00	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
09/03/14	0	0.00	0.00	0.04-0.24	h	-	-	20	0.67	0.00	0.00	m	-	-
09/04/14	0	0.00	0.12	0.25-0.43	m	-	-	20	0.50	0.00	0.00	m	-	-
09/05/14	20	0.25	0.04	0.04-0.24	h	-	-	30	0.40	0.00	0.00	m	-	-
09/06/14	10	0.15	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/07/14	0	0.00	0.12	0.25-0.43	m	-	-	0	0.00	0.00	0.25-0.43	m	-	-
09/08/14	30	0.50	0.04	1.03-1.22	h	h	-	20	0.25	0.04	0.44-0.63	h	-	-
09/09/14	20	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/10/14	20	0.50	0.00	0.00	m	-	-	20	0.50	0.00	0.00	m	-	-
09/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/12/14	0	0.00	0.12	0.04-0.24	m	-	-	0	0.00	0.16	0.64-0.83	m	m	-
09/13/14	20	0.67	1.06	0.84-1.02	h	h	-	40	1.25	0.08	0.04-0.24	m	-	x
09/14/14	20	0.25	0.20	0.00	m	-	-	30	0.35	0.16	0.04-0.24	h	-	-
09/15/14	20	0.15	0.00	0.00	m	-	-	20	0.20	0.00	0.00	m	-	-
09/16/14	10	0.15	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/20/14	20	0.25	0.00	0.00	m	-	-	40	0.25	0.00	0.04-0.24	h	-	-
09/21/14	70	0.75	0.28	0.25-0.43	h	-	x	80	0.75	0.51	0.44-0.63	h	h	-
09/22/14	50	0.75	0.20	0.44-0.63	h	h	-	50	1.00	0.28	0.64-0.83	h	h	-
09/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
Date	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
09/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/29/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/30/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
30 days					23/30*	3/3*	1					22/30*	2/3*	1
	Sycamore Creek							Phoenix North						
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
06/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/24/14	20	0.10	0.00	0.00	m	-	-	0	0.00	0.00	0.04-0.24	h	-	-
06/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/26/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
06/27/14	30	0.40	0.63	0.25-0.43	h	m	-	20	0.20	0.00	0.00	m	-	-
06/28/14	50	0.50	0.00	0.25-0.43	h	-	-	30	0.30	0.00	0.00	m	-	-
06/29/14	20	0.20	0.00	0.04-0.24	h	-	-	10	0.10	0.55	0.64-0.83	m	m	-
06/30/14	40	0.50	0.08	0.25-0.43	h	-	-	30	0.40	0.04	0.04-0.24	h	-	-
16 days					15/16*	0/1*	0					13/16*	0/1*	0
07/01/14	20	0.25	0.00	0.00	m	-	-	0	0.00	0.00	0.00	h	-	-
07/02/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.47	0.64-0.83	m	m	-
07/03/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.12	0.25-0.43	m	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
07/04/14	30	0.75	0.00	0.00	m	-	-	20	0.67	0.00	0.00	m	-	-
07/05/14	0	0.00	0.04	0.4-0.24	m	-	-	0	0.00	0.08	0.25-0.43	m	-	-
07/06/14	20	0.35	0.00	0.00	m	-	-	10	0.25	0.00	0.00	h	-	-
07/07/14	20	0.20	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
07/08/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/09/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/10/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/12/14	10	0.10	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/13/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/14/14	30	0.25	0.00	0.00	m	-	-	0	0.00	0.00	0.00	h	-	-
07/15/14	10	0.10	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/17/14	50	0.75	0.12	0.04-0.24	m	-	x	50	1.00	0.04	0.25-0.43	m	-	x
07/18/14	40	0.75	0.43	0.25-0.43	h	-	x	50	0.75	0.28	0.25-0.43	m	-	x
07/19/14	10	2.00	0.00	0.25-0.43	m	-	-	10	1.50	0.00	0.00	m	-	-
07/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/28/14	10	0.10	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.25-0.43	m	-	-
07/29/14	30	0.50	0.28	1.23-1.61	h	h	-	50	1.00	0.00	0.00	m	-	x
07/30/14	30	0.40	0.00	0.00	m	-	-	10	0.25	0.00	0.00	h	-	-
07/31/14	50	1.25	0.12	1.03-1.22	h	h	-	40	1.00	0.08	0.25-0.43	m	-	x
31 days					23/31*	2/2*	2					21/31*	0/1*	4

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
Date	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
08/01/14	20	0.75	0.00	0.00	m	-	-	20	0.75	0.00	0.00	m	-	-
08/02/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/03/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/04/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/05/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/06/14	20	0.25	0.00	0.00	m	-	-	20	0.25	0.00	0.00	m	-	-
08/07/14	10	0.25	0.67	0.44-0.63	m	m	-	10	0.25	0.20	0.25-0.43	h	-	-
08/08/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/09/14	10	0.10	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/10/14	20	0.50	0.00	0.04-0.24	m	-	-	10	0.25	0.08	0.25-0.43	h	-	-
08/11/14	20	0.25	0.39	0.64-0.83	m	m	-	10	0.25	0.12	0.25-0.43	h	-	-
08/12/14	20	0.15	0.00	0.00	m	-	-	20	0.35	0.00	0.00	m	-	-
08/13/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/14/14	10	0.33	0.00	0.84-1.02	m	m	-	0	0.00	0.00	0.00	h	-	-
08/15/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/16/14	10	0.50	0.00	0.00	m	-	-	0	0.00	0.00	0.00	h	-	-
08/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/22/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/23/14	30	0.40	0.00	0.25-0.43	h	-	-	20	0.10	0.04	0.04-0.24	h	-	-
08/24/14	40	0.50	0.00	0.25-0.43	h	-	-	30	0.50	0.00	0.04-0.24	m	-	-
08/25/14	30	0.50	0.31	0.44-0.63	h	h	-	30	0.75	0.00	0.00	m	-	-
08/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/27/14	30	0.50	0.08	0.25-0.43	h	-	-	30	0.35	0.31	0.44-0.63	h	-	-
08/28/14	10	0.33	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/29/14	30	0.67	0.28	1.03-1.22	h	h	-	20	0.50	0.04	0.44-0.63	h	h	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
Date	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
08/30/14	30	0.67	0.00	0.00	m	-	-	20	0.50	0.00	0.04-0.24	m	-	-
08/31/14	30	0.75	0.39	0.44-0.63	h	h	-	20	0.50	0.71	1.82-2.01	h	h	-
31 days					22/31*	3/6*	0					25/31*	2/2*	0
09/01/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
09/02/14	10	0.15	0.00	0.00	h	-	-	10	0.15	0.00	0.04-0.24	h	-	-
09/03/14	30	0.67	0.00	0.00	m	-	-	30	0.67	0.00	0.00	m	-	-
09/04/14	30	0.67	0.00	0.00	m	-	-	20	0.50	0.00	0.04-0.24	m	-	-
09/05/14	10	0.25	0.00	0.00	h	-	-	10	0.35	0.00	0.00	h	-	-
09/06/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/07/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
09/08/14	10	0.25	0.08	0.25-0.43	h	-	-	10	0.10	0.00	0.00	h	-	-
09/09/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/10/14	20	0.25	0.00	0.00	m	-	-	10	0.10	0.00	0.00	h	-	-
09/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/12/14	0	0.00	0.24	1.03-1.22	m		-	0	0.00	0.00	0.00	h	-	-
09/13/14	50	1.50	0.04	0.25-0.43	m	-	x	40	1.00	0.59	0.64-0.83	h	h	-
09/14/14	30	0.35	0.28	0.25-0.43	h	-	-	30	0.35	0.91	0.44-0.63	m	m	-
09/15/14	20	0.15	0.00	0.00	m	-	-	20	0.20	0.00	0.00	m	-	-
09/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/20/14	50	0.33	0.00	0.00	m	-	-	40	0.25	0.00	0.00	m	-	-
09/21/14	80	0.75	0.12	0.04-0.24	m	-	x	50	1.00	0.00	0.04-0.24	m	-	x
09/22/14	60	1.00	0.00	0.04-0.24	m	-	x	50	0.75	0.04	1.03-1.22	h	h	-
09/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
09/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/29/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/30/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
30 days					21/30*	0	3					24/30*	2/3*	1
	Phoenix South							Scottsdale North						
06/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/26/14	0	0.00	0.04	0.04-0.24	m	-	-	0	0.00	0.12	0.04-0.24	m	-	-
06/27/14	20	0.20	0.00	0.04-0.24	h	-	-	30	0.30	0.00	0.00	m	-	-
06/28/14	20	0.30	0.00	0.00	m	-	-	30	0.30	0.00	0.00	m	-	-
06/29/14	0	0.00	0.04	0.04-0.24	m	-	-	10	0.10	0.20	0.44-0.63	m	-	-
06/30/14	20	0.20	0.00	0.04-0.24	h	-	-	40	0.40	0.04	0.00	m	-	-
16 days					13/16*	0	0					11/16*	0	0
07/01/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/02/14	0	0.00	0.08	0.25-0.43	m	-	-	0	0.00	0.20	0.64-0.83	m	m	-
07/03/14	0	0.00	0.12	0.00	h	-	-	0	0.00	0.24	0.44-0.63	m	-	-
07/04/14	20	0.33	0.00	0.00	m	-	-	30	0.67	0.00	0.00	m	-	-
07/05/14	0	0.00	0.83	0.84-1.02	m	m	-	0	0.00	0.00	0.04-0.24	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
Date	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
07/06/14	10	0.15	0.00	0.00	h	-	-	20	0.25	0.20	0.25-0.43	h	-	-
07/07/14	0	0.00	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
07/08/14	0	0.00	0.00	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
07/09/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/10/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/12/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
07/13/14	0	0.00	0.00	0.04-0.24	h	-	-	10	0.15	0.04	0.04-0.24	h	-	-
07/14/14	10	0.15	0.00	0.00	h	-	-	30	0.25	0.00	0.04-0.24	h	-	-
07/15/14	10	0.20	0.00	0.00	h	-	-	10	0.20	0.00	0.00	h	-	-
07/16/14	10	0.20	0.00	0.00	h	-	-	10	0.20	0.00	0.00	h	-	-
07/17/14	50	0.75	0.47	0.64-0.83	h	h	-	50	0.75	0.00	0.04-0.24	m	-	x
07/18/14	50	0.75	0.43	0.44-0.63	h	h	-	50	0.75	0.12	0.04-0.24	m	-	x
07/19/14	10	1.25	0.00	0.00	m	-	-	10	1.50	0.00	0.04-0.24	m	-	-
07/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/28/14	10	0.05	0.00	0.00	h	-	-	0	0.00	0.04	0.04-0.24	m	-	-
07/29/14	50	1.00	0.00	0.00	m	-	x	50	1.50	0.00	0.04-0.24	m	-	x
07/30/14	10	0.25	0.00	0.00	h	-	-	20	0.40	0.00	0.00	m	-	-
07/31/14	30	0.75	0.87	1.03-1.22	h	h	-	40	1.00	1.06	1.23-1.61	h	h	-
31 days					26/31*	3/4*	1					22/31*	1/2*	3
08/01/14	10	0.50	0.00	0.00	m	-	-	20	0.75	0.00	0.00	m	-	-
08/02/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
Date	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
08/03/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/04/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/05/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/06/14	20	0.10	0.00	0.00	h	-	-	20	0.25	0.08	0.25-0.43	h	-	-
08/07/14	20	0.50	0.59	0.64-0.83	h	h	-	10	0.25	0.43	0.25-0.43	h	-	-
08/08/14	0	0.00	0.04	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/09/14	10	0.10	0.04	0.04-0.24	h	-	-	0	0.00	0.00	0.00	h	-	-
08/10/14	20	0.25	0.63	0.44-0.63	m	m	-	10	0.25	0.98	0.64-0.83	m	m	-
08/11/14	10	0.25	0.20	0.04-0.24	h	-	-	20	0.35	0.28	0.25-0.43	h	-	-
08/12/14	20	0.25	0.00	0.00	m	-	-	20	0.35	0.00	0.00	m	-	-
08/13/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/14/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/23/14	20	0.10	0.00	0.00	m	-	-	20	0.25	0.00	0.84-1.02	m	m	-
08/24/14	30	0.50	0.12	0.25-0.43	h	-	-	30	0.60	0.20	0.25-0.43	h	-	-
08/25/14	30	0.50	0.55	0.64-0.83	h	h	-	30	0.75	0.28	0.25-0.43	h	-	-
08/26/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
08/27/14	30	0.35	0.31	0.44-0.63	h	-	-	30	0.35	0.08	0.25-0.43	h	-	-
08/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/29/14	20	0.50	0.24	0.64-0.83	h	h	-	30	0.50	0.08	0.44-0.63	h	h	-
08/30/14	20	0.50	0.79	1.03-1.22	h	h	-	20	0.50	0.24	0.25-0.43	h	-	-
08/31/14	20	0.60	1.30	2.02-2.20	m	h	-	20	0.50	0.55	0.44-0.63	h	h	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
31 days					26/31*	5/6*	0					27/31*	2/4*	0
09/01/14	10	0.15	0.00	0.00	h	-	-	0	0.00	0.28	0.25-0.43	m	-	-
09/02/14	10	0.35	0.00	0.04-0.24	h	-	-	10	0.25	0.00	0.00	h	-	-
09/03/14	20	0.67	0.08	0.04-0.24	m	-	-	30	0.67	0.00	0.00	m	-	-
09/04/14	10	0.33	0.12	0.04-0.24	h	-	-	20	0.50	0.16	0.25-0.43	h	-	-
09/05/14	10	0.25	0.08	0.00	h	-	-	10	0.40	0.00	0.00	h	-	-
09/06/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/07/14	10	0.15	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
09/08/14	10	0.10	0.00	0.04-0.24	h	-	-	10	0.10	0.00	0.04-0.24	h	-	-
09/09/14	10	t	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/10/14	10	t	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/12/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/13/14	30	0.75	0.35	0.44-0.63	h	h	-	40	1.00	0.94	0.84-1.02	h	h	-
09/14/14	30	0.35	0.67	0.64-0.83	h	m	-	30	0.35	0.31	0.25-0.43	h	-	-
09/15/14	10	0.15	0.00	0.00	h	-	-	20	0.25	0.00	0.00	m	-	-
09/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/20/14	30	0.25	0.04	0.04-0.24	h	-	-	40	0.25	0.00	0.04-0.24	h	-	-
09/21/14	40	1.00	0.39	0.44-0.63	h	h	-	50	1.25	0.08	0.04-0.24	m	-	x
09/22/14	40	0.67	1.10	0.64-0.83	h	h	-	50	0.75	0.94	1.23-1.61	h	h	-
09/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
09/29/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/30/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
30 days					29/30*	3/4*	0					26/30*	2/2*	1
	Scottsdale South							Southeast Valley						
06/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/24/14	0	0.00	0.00	0.00	h	-	-	10	0.05	0.00	0.00	h	-	-
06/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/26/14	0	0.00	0.04	0.04-0.24	m	-	-	0	0.00	0.00	0.04-0.24	h	-	-
06/27/14	20	0.20	0.00	0.04-0.24	h	-	-	20	0.20	0.08	0.04-0.24	h	-	-
06/28/14	30	0.30	0.00	0.00	m	-	-	30	0.30	0.00	0.04-0.24	h	-	-
06/29/14	0	0.00	0.28	0.25-0.43	m	-	-	0	0.00	0.28	0.25-0.43	m	-	-
06/30/14	20	0.30	0.04	0.00	m	-	-	30	0.30	0.00	0.00	m	-	-
16 days					12/16*	0	0					14/16*	0	0
07/01/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/02/14	0	0.00	0.16	0.25-0.43	m	-	-	0	0.00	0.20	0.64-0.83	m	-	-
07/03/14	0	0.00	0.16	0.00	m	-	-	10	0.10	0.08	0.00	h	-	-
07/04/14	20	0.33	0.00	0.00	m	-	-	20	0.50	0.00	0.00	m	-	-
07/05/14	0	0.00	0.28	0.04-0.24	m	-	-	0	0.00	0.20	0.04-0.24	m	-	-
07/06/14	10	0.15	0.04	0.00	h	-	-	10	0.35	0.04	0.00	m	-	-
07/07/14	0	0.00	0.00	0.00	h	-	-	10	0.05	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
07/08/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
07/09/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/10/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/12/14	10	0.10	0.00	0.00	h	-	-	20	0.15	0.00	0.00	m	-	-
07/13/14	10	0.15	0.00	0.04-0.24	h	-	-	10	0.15	0.04	0.04-0.24	h	-	-
07/14/14	20	0.15	0.00	0.00	m	-	-	30	0.25	0.55	0.44-0.63	h	-	-
07/15/14	10	0.10	0.00	0.00	h	-	-	10	0.30	0.04	0.04-0.24	h	-	-
07/16/14	10	0.20	0.00	0.00	h	-	-	20	0.30	0.00	0.04-0.24	h	-	-
07/17/14	50	0.75	0.51	0.44-0.63	h	h	-	50	1.00	0.51	0.44-0.63	h	h	-
07/18/14	50	0.75	0.31	0.04-0.24	m	-	x	40	0.75	0.31	0.04-0.24	m	-	x
07/19/14	10	1.25	0.00	0.00	m	-	-	10	1.00	0.00	0.00	m	-	-
07/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/28/14	10	0.05	0.00	0.00	h	-	-	10	0.05	0.00	0.00	h	-	-
07/29/14	50	1.00	0.00	0.00	m	-	x	50	1.00	0.00	0.00	m	-	x
07/30/14	10	0.25	0.00	0.00	h	-	-	20	0.25	0.00	0.00	m	-	-
07/31/14	30	0.75	0.75	0.84-1.02	h	h	-	40	0.75	1.42	1.23-1.61	h	h	-
31 days					23/31*	2/2*	2					22/31*	2/2*	2
08/01/14	10	0.50	0.00	0.00	m	-	-	10	0.50	0.00	0.00	m	-	-
08/02/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/03/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/04/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
Date	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
08/05/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/06/14	20	0.10	0.08	0.04-0.24	h	-	-	20	0.25	0.12	0.04-0.24	h	-	-
08/07/14	20	0.50	0.31	0.44-0.63	h	h	-	20	0.50	0.83	0.64-0.83	h	h	-
08/08/14	0	0.00	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
08/09/14	10	0.10	0.04	0.04-0.24	h	-	-	10	0.25	0.04	0.04-0.24	h	-	-
08/10/14	20	0.25	0.16	0.25-0.43	h	-	-	30	0.50	0.63	0.84-1.02	h	h	-
08/11/14	10	0.25	0.20	0.25-0.43	h	-	-	20	0.50	0.47	0.44-0.63	h	h	-
08/12/14	20	0.25	0.00	0.00	m	-	-	20	0.25	0.00	0.00	m	-	-
08/13/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/14/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/22/14	0	0.00	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
08/23/14	20	0.10	0.00	0.00	m	-	-	30	0.25	0.00	0.00	m	-	-
08/24/14	30	0.50	0.08	0.04-0.24	m	-	-	40	0.75	0.12	0.25-0.43	m	m	-
08/25/14	30	0.50	0.16	0.04-0.24	m	-	-	40	0.75	0.55	0.44-0.63	h	h	-
08/26/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
08/27/14	30	0.35	0.55	0.64-0.83	h	m	-	30	0.35	1.02	0.84-1.02	m	m	-
08/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/29/14	20	0.50	0.24	0.64-0.83	h	h	-	30	0.67	0.67	1.03-1.22	h	h	-
08/30/14	20	0.50	0.04	0.04-0.24	m	-	-	20	0.33	0.55	0.64-0.83	h	m	-
08/31/14	20	0.60	1.30	1.62-1.81	m	h	-	30	0.75	1.06	1.23-1.61	h	h	-
31 days					24/31*	3/4*	0					26/31*	6/9*	0
09/01/14	0	0.00	0.16	0.04-0.24	m	-	-	10	0.15	0.28	0.25-0.43	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
09/02/14	10	0.25	0.00	0.04-0.24	h	-	-	10	0.35	0.00	0.04-0.24	h	-	-
09/03/14	20	0.67	0.08	0.04-0.24	m	-	-	30	0.75	0.04	0.04-0.24	m	-	-
09/04/14	10	0.33	0.12	0.04-0.24	h	-	-	20	0.33	0.00	0.00	m	-	-
09/05/14	10	0.25	0.08	0.00	h	-	-	10	0.25	0.08	0.00	h	-	-
09/06/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.04-0.24	h	-	-
09/07/14	10	0.10	0.00	0.00	h	-	-	10	0.15	0.00	0.00	h	-	-
09/08/14	10	0.10	0.12	0.04-0.24	h	-	-	10	0.10	0.12	0.04-0.24	h	-	-
09/09/14	10	t	0.00	0.00	h	-	-	20	0.10	0.00	0.04-0.24	h	-	-
09/10/14	10	t	0.00	0.00	h	-	-	10	t	0.00	0.00	h	-	-
09/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/12/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
09/13/14	30	0.75	0.28	0.64-0.83	h	h	-	30	1.00	0.28	0.25-0.43	m	-	x
09/14/14	30	0.35	0.91	0.44-0.63	m	m	-	30	0.50	0.43	0.25-0.43	h	-	-
09/15/14	10	0.15	0.00	0.00	h	-	-	10	0.25	0.20	0.04-0.24	h	-	-
09/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/20/14	30	0.25	0.00	0.00	m	-	-	30	0.25	0.04	0.04-0.24	h	-	-
09/21/14	40	1.00	0.04	0.00	m	-	x	50	1.00	0.31	0.25-0.43	m	-	x
09/22/14	40	0.67	1.34	1.23-1.61	h	h	-	40	0.67	1.61	1.82-2.01	m	h	-
09/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/29/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/30/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
30 days					25/30*	2/3*	1					25/30*	1/1*	2
	Lower Salt River Lakes							Superstition						
06/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
06/24/14	20	0.15	0.00	0.00	m	-	-	20	0.10	0.00	0.00	h	-	-
06/25/14	10	0.15	0.00	0.00	h	-	-	10	0.15	0.00	0.00	h	-	-
06/26/14	10	0.25	0.00	0.04-0.24	h	-	-	10	0.25	0.00	0.00	h	-	-
06/27/14	30	0.30	0.00	0.04-0.24	h	-	-	30	0.30	0.08	0.44-0.63	h	-	-
06/28/14	50	0.40	0.00	0.44-0.63	h	-	-	40	0.40	0.00	0.44-0.63	h	-	-
06/29/14	20	0.10	0.00	0.04-0.24	h	-	-	20	0.10	0.08	0.04-0.24	h	-	-
06/30/14	40	0.30	0.00	0.00	m	-	-	40	0.30	0.00	0.04-0.24	h	-	-
16 days					14/16*	0	0					16/16*	0	0
07/01/14	20	0.25	0.00	0.00	m	-	-	0	0.00	0.00	0.00	h	-	-
07/02/14	0	0.00	0.00	0.25-0.43	m	-	-	0	0.00	0.12	1.62-1.81	m	m	-
07/03/14	10	0.25	0.08	0.00	h	-	-	10	0.15	0.08	0.00	h	-	-
07/04/14	20	0.67	0.00	0.00	m	-	-	20	0.50	0.00	0.00	m	-	-
07/05/14	0	0.00	0.00	0.25-0.43	m	-	-	0	0.00	0.00	0.25-0.43	m	-	-
07/06/14	20	0.50	0.00	0.00	m	-	-	20	0.50	0.00	0.00	m	-	-
07/07/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
07/08/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/09/14	10	0.25	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
Date	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
07/10/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/12/14	20	0.25	0.00	0.00	m	-	-	20	0.25	0.00	0.00	m	-	-
07/13/14	10	0.25	0.00	0.00	h	-	-	10	0.25	0.04	0.00	h	-	-
07/14/14	30	0.40	0.24	0.64-0.83	h	-	-	30	0.40	0.55	1.03-1.22	h	m	-
07/15/14	10	0.30	0.00	0.00	h	-	-	10	0.30	0.47	0.44-0.63	h	-	-
07/16/14	10	0.30	0.00	0.00	h	-	-	20	0.30	0.00	0.04-0.24	h	-	-
07/17/14	40	1.00	0.00	0.00	m	-	x	40	1.00	0.00	0.00	m	-	x
07/18/14	30	0.50	0.12	0.04-0.24	m	-	-	30	0.50	0.35	0.04-0.24	h	-	-
07/19/14	10	1.25	0.00	0.00	m	-	-	10	1.25	0.00	0.00	m	-	-
07/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/22/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
07/28/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
07/29/14	30	0.50	0.00	1.23-1.61	m	h	-	30	0.50	0.04	0.84-1.02	h	h	-
07/30/14	30	0.40	0.00	0.00	m	-	-	30	0.40	0.00	0.00	m	-	-
07/31/14	30	0.75	0.00	0.25-0.43	h	-	-	30	0.75	1.06	1.03-1.22	h	h	-
31 days					20/31*	1/1*	1					23/31*	2/4*	1
08/01/14	20	0.50	0.00	0.00	m	-	-	20	0.50	0.00	0.00	m	-	-
08/02/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/03/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/04/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/05/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/06/14	10	0.25	0.00	0.04-0.24	h	-	-	10	0.25	0.12	0.04-0.24	h	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
Date	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
08/07/14	20	0.50	0.04	0.25-0.43	h	-	-	20	0.50	0.67	0.64-0.83	h	h	-
08/08/14	10	0.25	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
08/09/14	20	0.25	0.00	0.00	m	-	-	10	0.25	0.00	0.04-0.24	h	-	-
08/10/14	30	0.50	0.00	0.04-0.24	m	-	-	30	0.50	0.00	0.04-0.24	m	-	-
08/11/14	30	1.00	0.51	0.44-0.63	h	h	-	20	1.00	0.59	0.44-0.63	h	h	-
08/12/14	20	0.25	0.00	0.00	m	-	-	20	0.25	0.00	0.00	m	-	-
08/13/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/14/14	0	0.00	0.00	0.64-0.83	m	-	-	0	0.00	0.04	0.04-0.24	m	-	-
08/15/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/20/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
08/21/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.04-0.24	h	-	-
08/22/14	10	0.25	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
08/23/14	30	0.40	0.00	0.00	m	-	-	30	0.40	0.00	0.00	m	-	-
08/24/14	40	0.50	0.04	0.04-0.24	m	-	x	40	0.50	0.12	0.04-0.24	m	-	x
08/25/14	40	1.00	0.00	0.64-0.83	h	h	-	40	1.00	0.16	0.25-0.43	m	-	x
08/26/14	10	0.25	0.00	0.04-0.24	h	-	-	10	0.25	0.00	0.04-0.24	h	-	-
08/27/14	20	0.25	0.00	1.03-1.22	m	m	-	20	0.25	0.00	0.25-0.43	h	-	-
08/28/14	0	0.00	0.00	0.64-0.83	m	m	-	0	0.00	0.00	0.00	h	-	-
08/29/14	30	0.67	0.00	0.84-1.02	h	h	-	30	0.67	0.04	1.62-1.81	h	h	-
08/30/14	20	0.50	0.00	0.04-0.24	m	-	-	20	0.50	0.24	0.25-0.43	h	-	-
08/31/14	30	0.75	0.85	1.03-1.22	h	h	-	30	0.75	0.35	0.44-0.63	h	h	-
31 days					21/31*	4/6*	1					24/31*	4/4*	2
09/01/14	10	0.25	0.00	0.04-0.24	h	-	-	10	0.25	0.04	0.04-0.24	h	-	-
09/02/14	10	0.25	0.00	0.00	h	-	-	10	0.25	0.00	0.00	h	-	-
09/03/14	30	0.75	0.00	0.00	m	-	-	30	0.75	0.00	0.00	m	-	-

TABLE A-1: MSP Outlooks Issued, Daily Verification Table - Monsoon Season 2015														
	Forecast Zone Data				Verification			Forecast Zone Data				Verification		
Date	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA	Prob. (%)	QPF (in)	ALERT (in)	GAQPE (in)	AOF	POD	FA
09/04/14	30	0.50	0.00	0.00	m	-	-	20	0.50	0.00	0.00	m	-	-
09/05/14	20	0.35	0.00	0.00	m	-	-	20	0.35	0.00	0.00	m	-	-
09/06/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/07/14	10	0.10	0.00	0.00	h	-	-	10	0.10	0.00	0.00	h	-	-
09/08/14	10	0.10	0.04	0.25-0.43	h	-	-	10	0.10	0.00	0.04-0.24	h	-	-
09/09/14	20	0.10	0.00	0.00	m	-	-	20	0.10	0.00	0.00	h	-	-
09/10/14	10	t	0.00	0.00	h	-	-	10	t	0.00	0.00	h	-	-
09/11/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/12/14	0	0.00	0.00	0.64-0.83	m	-	-	0	0.00	0.24	0.64-0.83	m	-	-
09/13/14	40	1.25	0.20	0.25-0.43	m	-	x	30	1.25	0.20	0.25-0.43	m	-	x
09/14/14	30	0.50	0.16	0.25-0.43	h	-	-	30	0.50	0.20	0.25-0.43	h	-	-
09/15/14	20	0.25	0.00	0.04-0.24	h	-	-	20	0.15	0.04	0.04-0.24	h	-	-
09/16/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/17/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/18/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/19/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/20/14	40	0.25	0.00	0.04-0.24	h	-	-	30	0.25	0.04	0.04-0.024	h	-	-
09/21/14	60	1.25	0.00	0.25-0.43	m	-	x	70	1.25	0.43	0.25-0.43	m	-	x
09/22/14	50	0.75	0.24	1.03-1.22	h	h	-	50	0.75	0.59	0.64-0.83	h	h	-
09/23/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/24/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/25/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/26/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/27/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/28/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/29/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
09/30/14	0	0.00	0.00	0.00	h	-	-	0	0.00	0.00	0.00	h	-	-
30 days					23/30*	1/1*	2					24/30*	1/1*	2

TABLE A-2: This table shows the verification data of MSP issued precipitation forecasts contained in the daily Outlooks for the 2015 Monsoon Season. It is a monthly tally of the data contained in Table A-1. The table is broken down by month and MSP Forecast Zone. The columns from left to right are defined as follows:

Accurate Forecasts – Number of correct forecasts days out of total days in the month.

Accuracy – Accuracy of forecasts in percent.

Op. Sig. Events Detected – Number of operationally significant days detected correctly.

POD – Probability of detection in percent.

False Alarms – Number of false alarms that month.

FAR – False alarm rate in percent.

TABLE A-2: MSP Weather Outlook Verification – Monsoon Season 2015						
Forecast Zone	Accurate Forecasts	AOF (%)	Sig. Events Detected	POD (%)	False Alarms	FAR (%)
JUNE						
Gila Bend	15/16	93.8%	1/2	50%	0	0%
Palo Verde	14/16	87.5%	0/3	0%	0	0%
Rainbow Valley	15/16	93.8%	0/0	n/a	0	0%
West Valley	14/16	87.5%	0/0	n/a	0	0%
Northwest Valley	14/16	87.5%	0/0	n/a	0	0%
Upper Centennial	15/16	93.8%	1/2	50%	0	0%
Wickenburg	15/16	93.8%	0/1	0%	1	6.3%
New River/Cave Creek	15/16	93.8%	0/1	0%	0	0%
Sycamore Creek	15/16	93.8%	0/1	0%	0	0%
Phoenix North	13/16	81.3%	0/1	0%	0	0%
Phoenix South	13/16	81.3%	0/0	n/a	0	0%
Scottsdale North	11/16	68.8%	0/0	n/a	0	0%
Scottsdale South	12/16	75%	0/0	n/a	0	0%
Southeast Valley	14/16	87.5%	0/0	n/a	0	0%
Lower Salt River Lakes	14/16	87.5%	0/0	n/a	0	0%
Superstition	16/16	100%	0/0	n/a	0	0%

TABLE A-2: MSP Weather Outlook Verification – Monsoon Season 2015						
Forecast Zone	Accurate Forecasts	AOF (%)	Sig. Events Detected	POD (%)	False Alarms	FAR (%)
All Zones	225/256	87.9%	2/11	18.2%	1/256	0.4%
JULY						
Gila Bend	24/31	77.4%	4/9	44.4%	1	3.2%
Palo Verde	24/31	77.4%	2/4	50%	2	6.5%
Rainbow Valley	20/31	64.5%	2/5	40%	2	6.5%
West Valley	25/31	80.6%	3/4	75%	1	3.2%
Northwest Valley	23/31	74.2%	3/5	60%	1	3.2%
Upper Centennial	24/31	77.4%	5/8	62.5%	1	3.2%
Wickenburg	24/31	77.4%	5/6	83.3%	1	3.2%
New River/Cave Creek	22/31	71%	4/6	66.7%	2	6.5%
Sycamore Creek	23/31	74.2%	2/2	100%	2	6.5%
Phoenix North	21/31	67.7%	0/1	0%	4	13.3%
Phoenix South	26/31	83.9%	3/4	75%	1	3.2%
Scottsdale North	22/31	71%	1/2	50%	3	9.7%
Scottsdale South	23/31	74.2%	2/2	100%	2	6.5%
Southeast Valley	22/31	71%	2/2	100%	2	6.5%
Lower Salt River Lakes	20/31	64.5%	1/1	100%	1	3.2%
Superstition	23/31	74.2%	2/4	50%	1	3.2%
All Zones	366/496	73.4%	41/65	63.1%	27/496	5.4%
AUGUST						
Gila Bend	20/31	64.5%	3/8	37.5%	1	3.2%
Palo Verde	25/31	80.6%	1/3	33.3%	1	3.2%
Rainbow Valley	23/31	74.2%	1/4	25%	0	0%
West Valley	23/31	74.2%	1/4	25%	0	0%
Northwest Valley	24/31	77.4%	2/5	40%	0	0%
Upper Centennial	25/31	80.6%	4/5	80%	0	0%
Wickenburg	30/31	96.8%	2/4	50%	0	0%
New River/Cave Creek	26/31	83.9%	5/6	83.3%	0	0%
Sycamore Creek	22/31	71%	3/6	50%	0	0%

TABLE A-2: MSP Weather Outlook Verification – Monsoon Season 2015						
Forecast Zone	Accurate Forecasts	AOF (%)	Sig. Events Detected	POD (%)	False Alarms	FAR (%)
Phoenix North	25/31	80.6%	2/2	100%	0	0%
Phoenix South	26/31	83.9%	5/6	83.3%	0	0%
Scottsdale North	27/31	87.1%	2/4	50%	0	0%
Scottsdale South	24/31	77.4%	3/4	75%	0	0%
Southeast Valley	26/31	83.9%	6/9	66.7%	0	0%
Lower Salt River Lakes	21/31	67.7%	4/6	66.7%	1	3.2%
Superstition	24/31	77.4%	4/4	100%	2	6.5%
All Zones	391/496	78.8%	48/80	60%	5/496	1%
SEPTEMBER						
Gila Bend	25/30	83.3%	3/5	60%	0	0%
Palo Verde	24/30	80%	2/4	50%	0	0%
Rainbow Valley	26/30	86.7%	0/2	0%	0	0%
West Valley	24/30	80%	3/4	75%	0	0%
Northwest Valley	25/30	83.3%	2/3	66.7%	1	3.3%
Upper Centennial	23/30	76.7%	4/7	57.1%	0	0%
Wickenburg	23/30	76.7%	3/3	100%	1	3.3%
New River/Cave Creek	22/30	73.3%	2/3	66.7%	1	3.3%
Sycamore Creek	21/30	70%	0/0	n/a	3	10%
Phoenix North	24/30	80%	2/3	66.7%	1	3.3%
Phoenix South	29/30	96.7%	3/4	75%	0	0%
Scottsdale North	26/30	86.7%	2/2	100%	1	3.3%
Scottsdale South	25/30	83.3%	2/3	66.7%	1	3.3%
Southeast Valley	25/30	83.3%	1/1	100%	2	6.7%
Lower Salt River Lakes	23/30	76.7%	1/1	100%	2	6.7%
Superstition	24/30	80%	1/1	100%	2	6.7%
All Zones	389/480	81%	31/46	67.4%	15/480	3.1%

APPENDIX B: MSP MESSAGES - VERIFICATION TABLES

TABLE B-1: This table shows each of the individual MSP Statements issued during the 2015 Monsoon season including the detailed forecast rainfall information. The table is broken down by date and MSP Message. The columns from left to right are defined as follows:

Statement Details – Message information including date, time issued in local standard time, Forecast Zone, Message type, and issuing forecaster. Data is pulled directly from issued Message.

Forecast Rain – Rain information including forecast rainfall intensity and storm total precipitation where applicable. Data is pulled directly from issued Message. It is important to note that not all issued Messages contain forecast rainfall information (noted by an “N/A” in the table).

TABLE B-1: MSP Statements Issued - Monsoon Season 2015							
Statement Details						Forecast Rain	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Intensity (in/min)	STP (in)
06/29/15	19:23	Wickenburg	1	Henz	Now-9pm	-	0.75-1.00
06/29/15	20:00	Wickenburg	1U	Henz	Now-9pm	-	0.75-1.00
06/29/15	20:27	Wickenburg	3	Henz	Now-10pm	-	-
06/29/15	20:33	Upper Centennial	1	Henz	Now-10pm	-	0.75-1.00
07/06/15	4:10	Rainbow Valley	1	Waters	Now-5am	-	1.00
07/06/15	4:10	West Valley	1	Waters	Now-5am	-	1.00
07/06/15	4:10	Northwest Valley	1	Waters	Now-5am	-	1.00
07/06/15	4:10	Palo Verde	1	Waters	Now-5am	-	1.00
07/06/15	18:40	Northwest Valley	1	Henz	Now-730pm	0.50/20-30min	-
07/17/15	11:09	Gila Bend	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Palo Verde	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Rainbow Valley	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Northwest Valley	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Upper Centennial	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Wickenburg	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	New River/ Cave Creek	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Sycamore Creek	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Phoenix North	2	Henz	5pm 7/17 - 11pm 7/18	-	-

TABLE B-1: MSP Statements Issued - Monsoon Season 2015

Statement Details						Forecast Rain	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Intensity (in/min)	STP (in)
07/17/15	11:09	Phoenix South	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Scottsdale North	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Scottsdale South	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Southeast Valley	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Lower Salt River Lakes	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	Superstition	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	11:09	West Valley	2	Henz	5pm 7/17 - 11pm 7/18	-	-
07/17/15	14:40	Gila Bend	1	Waters	230pm-5pm	0.50-0.75/60min	-
07/17/15	16:49	Palo Verde	1	Waters	445pm-6pm	0.50/30min	-
07/17/15	18:13	Upper Centennial	1	Waters	6pm-8pm	-	-
07/17/15	18:13	Wickenburg	1	Waters	6pm-8pm	-	-
07/17/15	20:04	Wickenburg	3	Waters	8pm-10pm	-	-
07/18/15	13:52	Gila Bend	1	Henz	Now-4pm	-	0.40-0.60/1.00-1.50
07/18/15	15:01	Rainbow Valley	1	Henz	Now-430pm	-	0.40-0.60
07/18/15	15:14	West Valley	1	Henz	Now-430pm	-	1.00-1.50
07/18/15	16:02	Northwest Valley	1	Henz	Now-530pm	-	1.00-1.50
07/18/15	16:59	Wickenburg	1	Waters	Now-6pm	-	0.75
07/18/15	17:23	Wickenburg	3	Waters	Now-630pm	-	-
07/18/15	19:02	Wickenburg	3U	Waters	Extended 10pm	-	-
07/18/15	20:34	Gila Bend	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Palo Verde	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Rainbow Valley	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Northwest Valley	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Upper Centennial	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Wickenburg	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	New River/ Cave Creek	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Sycamore Creek	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Phoenix North	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Phoenix South	2U	Henz	Extended 5am 7/19	-	-

TABLE B-1: MSP Statements Issued - Monsoon Season 2015

Statement Details						Forecast Rain	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Intensity (in/min)	STP (in)
07/18/15	20:34	Scottsdale North	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Scottsdale South	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Southeast Valley	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Lower Salt River Lakes	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	Superstition	2U	Henz	Extended 5am 7/19	-	-
07/18/15	20:34	West Valley	2U	Henz	Extended 5am 7/19	-	-
07/29/15	19:04	Lower Salt River Lakes	1	Henz	Now-830pm	-	1.00-2.00
07/31/15	13:45	Superstition	1	Waters	Now-245pm	1.00/60min	-
07/31/15	14:20	Phoenix North	1	Waters	215pm-315pm	0.75/30min	-
07/31/15	14:20	Scottsdale North	1	Waters	215pm-315pm	0.75/30min	-
07/31/15	14:29	Wickenburg	1	Waters	Now-330pm	1.00/60min	-
07/31/15	14:46	Phoenix South	1	Waters	Now-330pm	0.50-0.75/30min	-
07/31/15	14:46	Scottsdale South	1	Waters	Now-330pm	0.50-0.75/30min	-
07/31/15	14:46	Southeast Valley	1	Waters	Now-330pm	0.50-0.75/30min	-
07/31/15	15:32	West Valley	1	Waters	Now-415pm	0.75-1.00/60min	-
07/31/15	15:32	Northwest Valley	1	Waters	Now-415pm	0.75"-1.00"/60min	-
07/31/15	14:46	Phoenix South	1U	Waters	Extd-430pm	-	-
07/31/15	14:46	Scottsdale South	1U	Waters	Extd-430pm	-	-
07/31/15	14:46	Southeast Valley	1U	Waters	Extd-430pm	-	-
07/31/15	16:31	Rainbow Valley	1	Waters	Now-515pm	0.50-0.75/30min	-
07/31/15	17:29	Southeast Valley	1	Waters	Now-630pm	-	0.75
08/07/15	16:24	Southeast Valley	1	Waters	Now-530pm	-	0.50-0.75
08/07/15	16:24	Lower Salt River Lakes	1	Waters	445pm-530pm	-	0.50-0.75
08/07/15	16:24	Superstition	1	Waters	Now-6pm	-	0.50-0.75
08/07/15	17:03	Phoenix South	1	Waters	Now-545pm	-	0.50
08/07/15	17:03	Scottsdale South	1	Waters	Now-545pm	-	0.50
08/11/15	9:31	Southeast Valley	1	Henz	Now-11am	-	0.50-0.75/1.00-1.50
08/11/15	9:51	Scottsdale North	1	Henz	Now-1115am	-	0.50-0.75/1.00-1.50
08/11/15	10:42	Northwest Valley	1	Henz	Now-1145am	-	0.40-0.60/1.00-1.50

TABLE B-1: MSP Statements Issued - Monsoon Season 2015

Statement Details						Forecast Rain	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Intensity (in/min)	STP (in)
08/11/15	10:49	Wickenburg	1	Henz	Now-1215pm	-	0.40-0.60/1.00-1.50
08/11/15	20:58	Southeast Valley	1	Henz	Now-1030pm	-	0.50-0.75/1.00-1.50
08/11/15	21:37	Phoenix South	1	Henz	Now-1045pm	-	0.50-0.75/1.00-1.50
08/11/15	21:37	Scottsdale South	1	Henz	Now-1045pm	-	0.50-0.75/1.00-1.50
08/24/15	17:11	New River/ Cave Creek	1	Henz	Now-630pm	-	0.40-0.70/1.00
08/25/15	16:45	Southeast Valley	1	Henz	Now-6pm	-	0.50-0.75/1.00
08/25/15	17:14	Phoenix South	1	Henz	Now-615pm	-	0.50-0.75/1.00
08/27/15	15:13	Northwest Valley	1	Henz	Now-430pm	-	0.50-0.75/1.00
08/27/15	15:31	West Valley	1	Henz	Now-5pm	-	0.50-0.75/1.00
08/27/15	15:44	Phoenix North	1	Henz	Now-5pm	-	0.50-0.75/1.00-1.25
08/27/15	16:23	Phoenix South	1	Henz	Now-545pm	-	0.50-0.75/1.00
08/27/15	16:30	Southeast Valley	1	Henz	Now-6pm	-	0.50-0.75/1.00-1.25
08/27/15	16:42	West Valley	3	Henz	Now-630pm	-	1.50-2.00
08/27/15	16:48	Rainbow Valley	1	Henz	Now-615pm	-	0.75-1.25
08/27/15	17:18	Rainbow Valley	3	Henz	Now-7pm	-	-
08/31/15	18:55	Phoenix South	1	Henz	Now-830pm	-	0.50-0.75/1.00
08/31/15	19:53	Phoenix South	3	Henz	Now-9pm	-	-
08/31/15	19:54	Phoenix North	1	Henz	Now-9pm	-	0.50-0.75/1.00
08/31/15	19:54	Scottsdale South	1	Henz	Now-9pm	-	0.50-0.75/1.00
08/31/15	20:06	Southeast Valley	1	Henz	Now-930pm	-	0.50-0.75/1.00-1.25
08/31/15	20:21	Superstition	1	Henz	Now-945pm	-	0.50-0.75/1.00-1.25
08/31/15	20:48	Phoenix South	3U	Henz	Now-10pm	-	-
08/31/15	21:06	Scottsdale North	1	Henz	Now-1030pm	-	0.50-0.75/1.00
08/31/15	21:14	New River/ Cave Creek	1	Henz	Now-1030pm	-	0.50-0.75/1.00-1.25
09/03/15	17:56	Palo Verde	1	Waters	Now-630pm	-	0.50
09/03/15	17:56	West Valley	1	Waters	Now-630pm	-	0.50
09/04/15	15:55	Palo Verde	1	Waters	Now-430pm	0.50/20-30min	-
09/04/15	17:08	Upper Centennial	1	Waters	530pm-630pm	-	-
09/04/15	17:08	Wickenburg	1	Waters	530pm-630pm	-	-

TABLE B-1: MSP Statements Issued - Monsoon Season 2015

Statement Details						Forecast Rain	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Intensity (in/min)	STP (in)
09/08/15	16:59	Wickenburg	1	Henz	Now-630pm	-	0.40-0.70/1.00-1.25
09/13/15	20:35	Rainbow Valley	1	Waters	Now-9pm	-	0.75
09/13/15	20:35	West Valley	1	Waters	Now-9pm	-	0.75
09/13/15	20:58	Phoenix South	1	Waters	9pm-930pm	-	0.50
09/13/15	21:22	Northwest Valley	1	Waters	915pm-945pm	-	0.25-0.50
09/13/15	21:22	Phoenix North	1	Waters	915pm-945pm	-	0.25-0.50
09/13/15	22:13	Phoenix South	1	Waters	1015pm-1045pm	0.50/30min	-
09/14/15	19:10	Phoenix South	1	Henz	Now-8pm	-	0.25-0.50/0.75
09/14/15	19:26	Scottsdale South	1	Henz	Now-830pm	-	0.25-0.50/0.75
09/14/15	19:46	Scottsdale North	1	Henz	Now-845pm	-	0.30-0.60/0.75
09/14/15	19:49	Phoenix North	1	Henz	Now-845pm	-	0.50-0.75/1.00
09/20/15	19:16	Gila Bend	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Palo Verde	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Rainbow Valley	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	West Valley	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Northwest Valley	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Upper Centennial	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Wickenburg	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	New River/ Cave Creek	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Sycamore Creek	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Phoenix North	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Phoenix South	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Scottsdale North	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Scottsdale South	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Southeast Valley	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Lower Salt River Lakes	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Superstition	2	Waters	8am 9/21-11pm 9/22	-	-
09/21/15	12:17	Gila Bend	1	Waters	Now-2pm	-	0.50-0.75
09/22/15	17:55	Phoenix South	1	Waters	Now-630pm	-	-

TABLE B-1: MSP Statements Issued - Monsoon Season 2015							
Statement Details						Forecast Rain	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Intensity (in/min)	STP (in)
09/22/15	17:55	Scottsdale North	1	Waters	Now-630pm	-	-
09/22/15	17:55	Scottsdale South	1	Waters	Now-630pm	-	-
09/22/15	18:05	Southeast Valley	1	Waters	Now-7pm	-	0.75
09/22/15	18:15	Superstition	1	Waters	Now-715pm	1.00/60min	-
09/22/15	18:35	Gila Bend	3	Waters	Now-8pm	-	-
09/22/15	19:02	Southeast Valley	3	Waters	Now-9pm	-	-

TABLE B-2: This table shows the raw verification data of MSP issued Messages for the 2015 Monsoon Season. The valid period for rainfall for each Message can be found in Table B-1. The table is broken down by date and MSP Message. The columns from left to right are defined as follows:

Statement Details – Statement information including date, Forecast Zone, and Message type.

Forecast Rain – Rain information including forecast rainfall intensity and forecast storm total precipitation where applicable. It is important to note that not all issued statements contain forecast rainfall information (noted by an “n/a” in the table).

Rain Observations – Observed rainfall amounts within the forecast zone including ALERT rain gages, gage adjusted radar rainfall totals, and local storm reports submitted to NWS Phoenix WFO.

Alarms – Triggered alarms on ALERT gage sensors. These alarms are broken down by alarm type including rain, stream, and dam.

Verification – The verification was broken down by rain and by alarm. Hits and misses were assigned based on thresholds previously discussed in the [MSP Verification Metrics and Criteria](#) section of this report.

TABLE B-2: MSP Statements Issued - Monsoon Season 2015											
Statement Details			Forecast Rain		Rain Observations (in)			Alarms			Verification
Date	MSP Forecast Zone	Message	Intensity (in/min)	STP (in)	ALERT	GAQPE	LSRs	Rain	Stream	Dam	Hit/Miss
06/29/15	Wickenburg	1	-	0.75-1.00	0.55-	1.23-1.61	-	x	x	-	Hit
06/29/15	Wickenburg	3	-	0.75-1.00	-	-	-	-	-	-	-
06/29/15	Upper Centennial	1	-	-	0.55-	1.23-1.61	-	x	x	-	Hit
06/29/15	Rainbow Valley	1	-	0.75-1.00	0.51	0.64-0.83	-	-	-	-	Hit
07/06/15	West Valley	1	-	1.00	0.67	1.23-1.61	-	-	-	-	Hit
07/06/15	Northwest Valley	1	-	1.00	0.83	1.23-1.61	-	-	-	-	Hit
07/06/15	Palo Verde	1	-	1.00	0.28	0.64-0.83	-	-	-	-	Hit
07/06/15	Northwest Valley	1	-	1.00	1.14	1.62-1.81	-	X	-	-	Hit
07/06/15	Gila Bend	2	0.50/20-30min	-	0.75"	1.62-1.81	-	-	-	-	Hit
07/17/15	Palo Verde	2	-	-	-	-	-	-	-	-	Hit
07/17/15	Rainbow Valley	2	-	-	-	-	-	-	-	-	Hit
07/17/15	Northwest Valley	2	-	-	-	-	-	-	-	-	Hit
07/17/15	Upper Centennial	2	-	-	-	-	-	-	-	-	Hit

TABLE B-2: MSP Statements Issued - Monsoon Season 2015

Statement Details			Forecast Rain		Rain Observations (in)			Alarms			Verification
Date	MSP Forecast Zone	Message	Intensity (in/min)	STP (in)	ALERT	GAQPE	LSRs	Rain	Stream	Dam	Hit/Miss
07/17/15	Wickenburg	2	-	-	-	-	-	-	-	-	Hit
07/17/15	New River/ Cave Creek	2	-	-	-	-	-	-	-	-	Hit
07/17/15	Sycamore Creek	2	-	-	-	-	-	-	-	-	Miss
07/17/15	Phoenix North	2	-	-	-	-	-	-	-	-	Miss
07/17/15	Phoenix South	2	-	-	-	-	-	-	-	-	Miss
07/17/15	Scottsdale North	2	-	-	-	-	-	-	-	-	Miss
07/17/15	Scottsdale South	2	-	-	-	-	-	-	-	-	Miss
07/17/15	Southeast Valley	2	-	-	-	-	-	-	-	-	Miss
07/17/15	Lower Salt River Lakes	2	-	-	-	-	-	-	-	-	Miss
07/17/15	Superstition	2	-	-	-	-	-	-	-	-	Miss
07/17/15	West Valley	2	-	-	-	-	-	-	-	-	Miss
07/17/15	Gila Bend	1	-	-	-	-	-	-	-	-	Hit
07/17/15	Palo Verde	1	0.50-0.75/60min	-	0.24	0.24-0.39	-	-	-	-	Miss
07/17/15	Upper Centennial	1	0.50/30min	-	0.00	1.81-1.95	-	-	-	-	Hit
07/17/15	Wickenburg	1	-	-	0.75	2.61-2.80	-	-	-	-	Hit
07/17/15	Wickenburg	3	-	-	0.43	1.03-1.22	-	X	X	-	Hit
07/17/15	Gila Bend	1	-	-	0.47	1.03-1.22	-	-	X	-	Hit
07/18/15	Rainbow Valley	1	-	0.40-0.60/1.00-1.50	0.00	2.02-2.21	-	-	-	-	Hit
07/18/15	West Valley	1	-	0.40-0.60	0.59	0.64-0.83	-	-	-	-	Hit
07/18/15	Northwest Valley	1	-	1.00-1.50	0.16	1.23-1.61	-	-	-	-	Hit
07/18/15	Wickenburg	1	-	1.00-1.50	0.75	1.23-1.61	-	X	-	-	Hit
07/18/15	Wickenburg	3	-	0.75	4.21	2.87+	2.00	X	X	X	Hit
07/18/15	Wickenburg	3U	-	-	2.87	2.87+	2.00	X	X	X	Hit
07/18/15	Lower Salt River Lakes	1	-	-	-	-	-	-	-	-	-
07/18/15	Superstition	1	-	-	-	-	-	-	-	-	-
07/18/15	Phoenix North	1	-	-	-	-	-	-	-	-	-
07/18/15	Scottsdale North	1	-	-	-	-	-	-	-	-	-
07/18/15	Wickenburg	1	-	-	-	-	-	-	-	-	-
07/18/15	Phoenix South	1	-	-	-	-	-	-	-	-	-

TABLE B-2: MSP Statements Issued - Monsoon Season 2015

Statement Details			Forecast Rain		Rain Observations (in)			Alarms			Verification
Date	MSP Forecast Zone	Message	Intensity (in/min)	STP (in)	ALERT	GAQPE	LSRs	Rain	Stream	Dam	Hit/Miss
07/18/15	Scottsdale South	1	-	-	-	-	-	-	-	-	-
07/18/15	Southeast Valley	1	-	-	-	-	-	-	-	-	-
07/18/15	West Valley	1	-	-	-	-	-	-	-	-	-
07/18/15	Northwest Valley	1	-	-	-	-	-	-	-	-	-
07/18/15	Phoenix South	1U	-	-	-	-	-	-	-	-	-
07/18/15	Scottsdale South	1U	-	-	-	-	-	-	-	-	-
07/18/15	Southeast Valley	1U	-	-	-	-	-	-	-	-	-
07/18/15	Rainbow Valley	1	-	-	-	-	-	-	-	-	-
07/18/15	Southeast Valley	1	-	-	-	-	-	-	-	-	-
07/18/15	Southeast Valley	1	-	-	-	-	-	-	-	-	-
07/18/15	Lower Salt River Lakes	1	-	-	-	-	-	-	-	-	-
07/29/15	Superstition	1	-	1.00-2.00	-	1.23-1.61	-	-	-	-	Hit
07/31/15	Phoenix South	1	1.00/60min	-	1.06	1.03-1.22	-	-	-	-	Hit
07/31/15	Scottsdale South	1	0.75/30min	-	0.04	0.04-0.24	-	-	-	-	Miss
07/31/15	Southeast Valley	1	0.75/30min	-	0.98	1.03-1.22	-	X	-	-	Hit
07/31/15	Scottsdale North	1	1.00/60min	-	1.46	2.02-2.20	-	X	-	-	Hit
07/31/15	Northwest Valley	1	0.50-0.75/30min	-	0.67	0.84-1.02	-	-	-	-	Hit
07/31/15	Wickenburg	1	0.50-0.75/30min	-	0.00	0.84-1.02	-	-	-	-	Hit
07/31/15	Southeast Valley	1	0.50-0.75/30min	-	0.24	0.24-0.39	-	-	-	-	Miss
07/31/15	Phoenix South	1	0.75-1.00/60min	-	0.31	1.22-1.38	-	-	-	-	Hit
07/31/15	Scottsdale South	1	0.75-1.00/60min	-	0.20	0.63-0.79	-	-	-	-	Hit
07/31/15	New River/ Cave Creek	1	-	-	-	-	-	-	-	-	-
07/31/15	Southeast Valley	1	-	-	-	-	-	-	-	-	-
07/31/15	Phoenix South	1	-	-	-	-	-	-	-	-	-
07/31/15	Northwest Valley	1	0.50-0.75/30min	-	0.24	1.03-1.22	-	-	-	-	Hit
07/31/15	West Valley	1	-	0.75	1.06	1.03-1.22	-	-	-	-	Hit
08/07/15	Phoenix North	1	-	0.50-0.75	0.28	0.64-0.83	-	-	-	-	Hit
08/07/15	Phoenix South	1	-	0.50-0.75	0.00	0.25-0.43	-	-	-	-	Hit
08/07/15	Southeast Valley	1	-	0.50-0.75	0.24	0.64-0.83	-	-	-	-	Hit

TABLE B-2: MSP Statements Issued - Monsoon Season 2015

Statement Details			Forecast Rain		Rain Observations (in)			Alarms			Verification
Date	MSP Forecast Zone	Message	Intensity (in/min)	STP (in)	ALERT	GAQPE	LSRs	Rain	Stream	Dam	Hit/Miss
08/07/15	Northwest Valley	3	-	0.50	0.47	0.64-0.83	-	-	-	-	Hit
08/07/15	Rainbow Valley	1	-	0.50	0.28	0.44-0.63	-	-	-	-	Hit
08/11/15	Rainbow Valley	3	-	0.50-0.75/1.00-1.50	0.63	0.84-1.02	0.50	-	-	-	Hit
08/11/15	Phoenix South	1	-	0.50-0.75/1.00-1.50	0.98	0.64-0.83	-	X	-	-	Hit
08/11/15	Phoenix South	3	-	0.40-0.60/1.00-1.50	0.59	0.84-1.02	-	-	-	-	Hit
08/11/15	Phoenix North	1	-	0.40-0.60/1.00-1.50	1.10	1.03-1.22	-	X	-	-	Hit
08/11/15	Scottsdale South	1	-	0.50-0.75/1.00-1.50	0.47	0.44-0.63	0.75	-	-	-	Hit
08/11/15	Southeast Valley	1	-	0.50-0.75/1.00-1.50	0.12	0.04-0.24	-	-	-	-	Miss
08/11/15	Superstition	1	-	0.50-0.75/1.00-1.50	0.16	0.25-0.43	-	-	-	-	Miss
08/24/15	Phoenix South	3U	-	0.40-0.70/1.00	0.75	0.84-1.02	-	-	-	-	Hit
08/25/15	Scottsdale North	1	-	0.50-0.75/1.00	0.47	0.44-0.63	-	-	-	-	Hit
08/25/15	New River/ Cave Creek	1	-	0.50-0.75/1.00	0.39	0.64-0.83	-	-	-	-	Hit
08/27/15	Palo Verde	1	-	0.50-0.75/1.00	0.87	1.23-1.61	0.50	-	-	-	Hit
08/27/15	West Valley	1	-	0.50-0.75/1.00	1.46	1.23-1.61	-	X	-	-	Hit
08/27/15	Palo Verde	1	-	0.50-0.75/1.00-1.25	0.31	0.44-0.63	-	-	-	-	Hit
08/27/15	Upper Centennial	1	-	0.50-0.75/1.00	0.31	1.03-1.22	-	-	-	-	Hit
08/27/15	Wickenburg	1	-	0.50-0.75/1.00-1.25	0.98	0.84-1.02	1.00	-	-	-	Hit
08/27/15	Wickenburg	1	-	1.50-2.00	1.46	1.23-1.61	-	X	-	-	Hit
08/27/15	Rainbow Valley	1	-	0.75-1.25	1.77	1.82-2.01	-	-	-	-	Hit
08/27/15	West Valley	1	-	-	1.77	1.82-2.01	-	-	-	-	Hit
08/31/15	Phoenix South	1	-	0.50-0.75/1.00	1.26	2.02-2.20	-	-	X	-	Hit
08/31/15	Northwest Valley	1	-	-	1.30	2.02-2.20	-	-	X	-	Hit
08/31/15	Phoenix North	1	-	0.50-0.75/1.00	0.71	1.82-2.01	-	-	-	X	Hit
08/31/15	Phoenix South	1	-	0.50-0.75/1.00	0.83	1.62-1.81	-	-	X	-	Hit
08/31/15	Phoenix South	1	-	0.50-0.75/1.00-1.25	0.98	1.23-1.61	-	-	-	-	Hit
08/31/15	Scottsdale South	1	-	0.50-0.75/1.00-1.25	0.35	0.44-0.63	-	-	-	-	Hit
08/31/15	Scottsdale North	1	-	-	-	-	-	-	-	-	-
08/31/15	Phoenix North	1	-	0.50-0.75/1.00	0.51	.44-0.63	-	-	-	-	Hit
08/31/15	Gila Bend	2	-	0.50-0.75/1.00-1.25	1.06	1.03-1.22	-	X	-	-	Hit

TABLE B-2: MSP Statements Issued - Monsoon Season 2015

Statement Details			Forecast Rain		Rain Observations (in)			Alarms			Verification
Date	MSP Forecast Zone	Message	Intensity (in/min)	STP (in)	ALERT	GAQPE	LSRs	Rain	Stream	Dam	Hit/Miss
09/03/15	Palo Verde	2	-	0.50	0.12	0.64-0.83	-	-	-	-	Hit
09/03/15	Rainbow Valley	2	-	0.50	0.04	0.04-0.24	-	-	-	-	Miss
09/04/15	West Valley	2	0.50/20-30min	-	0.24	0.84-1.02	-	-	-	-	Hit
09/04/15	Northwest Valley	2	-	-	0.39	1.03-1.22	-	-	-	-	Hit
09/04/15	Upper Centennial	2	-	-	0.00	0.25-0.43	-	-	-	-	Miss
09/08/15	Wickenburg	2	-	0.40-0.70/1.00-1.25	0.04	1.03-1.22	-	-	-	-	Hit
09/13/15	New River/ Cave Creek	2	-	0.75	0.51	2.81-3.19	-	-	-	-	Hit
09/13/15	Sycamore Creek	2	-	0.75	0.71	1.62-1.81	-	-	-	-	Hit
09/13/15	Phoenix North	2	-	0.50	0.04	0.04-0.24	-	-	-	-	Miss
09/13/15	Phoenix South	2	-	0.25-0.50	0.16	1.03-1.22	-	-	X	-	Hit
09/13/15	Scottsdale North	2	-	0.25-0.50	0.47	0.64-0.83	-	-	-	-	Hit
09/13/15	Scottsdale South	2	0.50/30min	-	0.28	0.25-0.43	-	-	-	-	Miss
09/14/15	Southeast Valley	2	-	0.25-0.50/0.75	0.67	0.64-0.83	0.93	X	-	-	Hit
09/14/15	Lower Salt River Lakes	2	-	0.25-0.50/0.75	0.91	0.44-0.63	-	X	X	X	Hit
09/14/15	Superstition	2	-	0.30-0.60/0.75	0.31	0.25-0.43	-	-	-	-	Miss
09/14/15	Gila Bend	1	-	0.50-0.75/1.00	0.91	0.44-0.63	-	X	X	X	Hit
09/20/15	Phoenix South	1	-	-	-	-	-	-	X	-	Hit
09/20/15	Scottsdale North	1	-	-	-	-	-	-	-	-	Miss
09/20/15	Scottsdale South	1	-	-	-	-	-	-	-	-	Miss
09/20/15	Southeast Valley	1	-	-	-	-	-	-	-	-	Miss
09/20/15	Superstition	1	-	-	-	-	-	-	-	-	Miss
09/20/15	Gila Bend	3	-	-	-	-	-	-	-	-	Miss
09/20/15	Southeast Valley	3	-	-	-	-	-	-	-	-	Miss
09/20/15	Wickenburg	1	-	-	-	-	-	-	-	-	Miss
09/20/15	Wickenburg	3	-	-	-	-	-	-	-	-	Miss
09/20/15	Upper Centennial	1	-	-	-	-	-	-	-	-	Miss
09/20/15	Rainbow Valley	1	-	-	-	-	-	-	-	-	Hit
09/20/15	West Valley	1	-	-	-	-	-	X	-	-	Hit
09/20/15	Northwest Valley	1	-	-	-	-	-	X	-	-	Hit

TABLE B-2: MSP Statements Issued - Monsoon Season 2015

Statement Details			Forecast Rain		Rain Observations (in)			Alarms			Verification
Date	MSP Forecast Zone	Message	Intensity (in/min)	STP (in)	ALERT	GAQPE	LSRs	Rain	Stream	Dam	Hit/Miss
09/20/15	Palo Verde	1	-	-	-	-	-	X	X	-	Hit
09/20/15	Northwest Valley	1	-	-	-	-	-	-	-	-	Miss
09/20/15	Gila Bend	2	-	-	-	-	-	-	-	-	Hit
09/21/15	Palo Verde	2	-	0.50-0.75	0.51	0.84-1.02	-	-	-	-	Hit
09/22/15	Rainbow Valley	2	-	-	1.10	0.64-0.83	-	-	-	-	Hit
09/22/15	Northwest Valley	2	-	-	0.91	1.23-1.61	-	X	-	-	Hit
09/22/15	Upper Centennial	2	-	-	1.34	1.23-1.61	-	X	-	-	Hit
09/22/15	Wickenburg	2	-	0.75	1.46	1.82-2.01	0.50	-	-	-	Hit
09/22/15	New River/ Cave Creek	2	1.00/60min	-	0.59	0.64-0.83	-	-	-	-	Hit
09/22/15	Sycamore Creek	2	-	-	0.04	1.62-1.81	-	-	X	-	Hit
09/22/15	Phoenix North	2	-	-	1.54	1.82-2.01	-	X	X	-	Hit

TABLE B-3: This table shows the lead time data of MSP issued Messages for the 2015 Monsoon Season. The table is broken down by Statement details and lead time. The columns from left to right are defined as follows:

Statement Details – Statement information including date, issue time, forecast zone, message type, forecaster, and valid time.

Statement Lead time – The first column denotes the time when the first ALERT Alarm (rain, stream, or impoundment) was triggered if any. The second column depicts the calculated lead time based on beginning statement valid time and when the first alarm was triggered.

TABLE B-3: MSP Statement Lead Time - Monsoon Season 2015							
Statement Details						Statement Lead Time	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Alarm Triggered	Lead Time(min)
06/29/15	19:23	Wickenburg	1	Henz	Now-9pm	20:07	0
06/29/15	20:27	Wickenburg	3	Henz	Now-10pm	20:20	0
06/29/15	20:33	Upper Centennial	1	Henz	Now-10pm	-	-
07/06/15	4:10	Rainbow Valley	1	Waters	Now-5am	-	-
07/06/15	4:10	West Valley	1	Waters	Now-5am	-	-
07/06/15	4:10	Northwest Valley	1	Waters	Now-5am	-	-
07/06/15	4:10	Palo Verde	1	Waters	Now-5am	2:39	0
07/06/15	18:40	Northwest Valley	1	Henz	Now-730pm	-	-
07/17/15	11:09	Gila Bend	2	Henz	5pm today - 11pm	14:40	211
07/17/15	11:09	Palo Verde	2	Henz	5pm today - 11pm	16:49	400
07/17/15	11:09	Rainbow Valley	2	Henz	5pm today - 11pm	15:01 7/18	1672
07/17/15	11:09	Northwest Valley	2	Henz	5pm today - 11pm	16:02 7/18	1733
07/17/15	11:09	Upper Centennial	2	Henz	5pm today - 11pm	18:13	424
07/17/15	11:09	Wickenburg	2	Henz	5pm today - 11pm	18:13	424
07/17/15	11:09	New River/ Cave	2	Henz	5pm today - 11pm	-	-
07/17/15	11:09	Sycamore Creek	2	Henz	5pm today - 11pm	-	-
07/17/15	11:09	Phoenix North	2	Henz	5pm today - 11pm	-	-
07/17/15	11:09	Phoenix South	2	Henz	5pm today - 11pm	-	-
07/17/15	11:09	Scottsdale North	2	Henz	5pm today - 11pm	-	-
07/17/15	11:09	Scottsdale South	2	Henz	5pm today - 11pm	-	-

TABLE B-3: MSP Statement Lead Time - Monsoon Season 2015							
Statement Details						Statement Lead Time	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Alarm Triggered	Lead Time(min)
07/17/15	11:09	Southeast Valley	2	Henz	5pm today - 11pm	-	-
07/17/15	11:09	Lower Salt River	2	Henz	5pm today - 11pm	-	-
07/17/15	11:09	Superstition	2	Henz	5pm today - 11pm	-	-
07/17/15	11:09	West Valley	2	Henz	5pm today - 11pm	15:14 7/18	1685
07/17/15	14:40	Gila Bend	1	Waters	230pm-5pm	-	-
07/17/15	16:49	Palo Verde	1	Waters	445pm-6pm	-	-
07/17/15	18:13	Upper Centennial	1	Waters	6pm-8pm	-	-
07/17/15	18:13	Wickenburg	1	Waters	6pm-8pm	17:59	0
07/17/15	20:04	Wickenburg	3	Waters	8pm-10pm	19:51	0
07/18/15	13:52	Gila Bend	1	Henz	Now-4pm	-	-
07/18/15	15:01	Rainbow Valley	1	Henz	Now-430pm	-	-
07/18/15	15:14	West Valley	1	Henz	Now-430pm	-	-
07/18/15	16:02	Northwest Valley	1	Henz	Now-530pm	17:06	64
07/18/15	16:59	Wickenburg	1	Waters	Now-6pm	17:10	11
07/18/15	17:23	Wickenburg	3	Waters	Now-630pm	17:22	0
07/18/15	19:02	Wickenburg	3U	Waters	Extended 10pm	-	-
07/29/15	19:04	Lower Salt River	1	Henz	Now-830pm	-	-
07/31/15	13:45	Superstition	1	Waters	Now-245pm	-	-
07/31/15	14:20	Phoenix North	1	Waters	215pm-315pm	-	-
07/31/15	14:20	Scottsdale North	1	Waters	215pm-315pm	15:30	70
07/31/15	14:29	Wickenburg	1	Waters	Now-330pm	14:26	3
07/31/15	14:46	Phoenix South	1	Waters	Now-330pm	-	-
07/31/15	14:46	Scottsdale South	1	Waters	Now-330pm	-	-
07/31/15	14:46	Southeast Valley	1	Waters	Now-330pm	-	-
07/31/15	15:32	West Valley	1	Waters	Now-415pm	-	-
07/31/15	15:32	Northwest Valley	1	Waters	Now-415pm	-	-
07/31/15	14:46	Phoenix South	1U	Waters	Extd-430pm	-	-
07/31/15	14:46	Scottsdale South	1U	Waters	Extd-430pm	-	-
07/31/15	14:46	Southeast Valley	1U	Waters	Extd-430pm	-	-

TABLE B-3: MSP Statement Lead Time - Monsoon Season 2015							
Statement Details						Statement Lead Time	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Alarm Triggered	Lead Time(min)
07/31/15	16:31	Rainbow Valley	1	Waters	Now-515pm	-	-
07/31/15	17:29	Southeast Valley	1	Waters	Now-630pm	-	-
08/07/15	16:24	Southeast Valley	1	Waters	Now-530pm	-	-
08/07/15	16:24	Lower Salt River	1	Waters	445pm-530pm	-	-
08/07/15	16:24	Superstition	1	Waters	Now-6pm	-	-
08/07/15	17:03	Phoenix South	1	Waters	Now-545pm	-	-
08/07/15	17:03	Scottsdale South	1	Waters	Now-545pm	-	-
08/11/15	9:31	Southeast Valley	1	Henz	Now-11am	-	-
08/11/15	9:51	Scottsdale North	1	Henz	Now-1115am	10:33	42
08/11/15	10:42	Northwest Valley	1	Henz	Now-1145am	-	-
08/11/15	10:49	Wickenburg	1	Henz	Now-1215pm	12:06	77
08/11/15	20:58	Southeast Valley	1	Henz	Now-1030pm	-	-
08/11/15	21:37	Phoenix South	1	Henz	Now-1045pm	-	-
08/11/15	21:37	Scottsdale South	1	Henz	Now-1045pm	-	-
08/24/15	17:11	New River/ Cave	1	Henz	Now-630pm	-	-
08/25/15	16:45	Southeast Valley	1	Henz	Now-6pm	-	-
08/25/15	17:14	Phoenix South	1	Henz	Now-615pm	-	-
08/27/15	15:13	Northwest Valley	1	Henz	Now-430pm	-	-
08/27/15	15:31	West Valley	1	Henz	Now-5pm	16:32	61
08/27/15	15:44	Phoenix North	1	Henz	Now-5pm	-	-
08/27/15	16:23	Phoenix South	1	Henz	Now-545pm	-	-
08/27/15	16:30	Southeast Valley	1	Henz	Now-6pm	-	-
08/27/15	16:42	Northwest Valley	3	Henz	Now-630pm	-	-
08/27/15	16:48	Rainbow Valley	1	Henz	Now-615pm	-	-
08/27/15	17:18	Rainbow Valley	3	Henz	Now-7pm	-	-
08/31/15	18:55	Phoenix South	1	Henz	Now-830pm	20:12	77
08/31/15	19:53	Phoenix South	3	Henz	Now-9pm	20:42	49
08/31/15	19:54	Phoenix North	1	Henz	Now-9pm	21:15	81
08/31/15	19:54	Scottsdale South	1	Henz	Now-9pm	20:23	29

TABLE B-3: MSP Statement Lead Time - Monsoon Season 2015

Statement Details						Statement Lead Time	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Alarm Triggered	Lead Time(min)
08/31/15	20:06	Southeast Valley	1	Henz	Now-930pm	-	-
08/31/15	20:21	Superstition	1	Henz	Now-945pm	-	-
08/31/15	20:48	Phoenix South	3U	Henz	Now-10pm	-	-
08/31/15	21:06	Scottsdale North	1	Henz	Now-1030pm	-	-
08/31/15	21:14	New River/ Cave	1	Henz	Now-1030pm	22:02	48
09/03/15	17:56	Palo Verde	1	Waters	Now-630pm	-	-
09/03/15	17:56	West Valley	1	Waters	Now-630pm	-	-
09/04/15	15:55	Palo Verde	1	Waters	Now-430pm	-	-
09/04/15	17:08	Upper Centennial	1	Waters	530pm-630pm	-	-
09/04/15	17:08	Wickenburg	1	Waters	530pm-630pm	-	-
09/08/15	16:59	Wickenburg	1	Henz	Now-630pm	-	-
09/13/15	20:35	Rainbow Valley	1	Waters	Now-9pm	-	-
09/13/15	20:35	West Valley	1	Waters	Now-9pm	-	-
09/13/15	20:58	Phoenix South	1	Waters	9pm-930pm	-	-
09/13/15	21:22	Northwest Valley	1	Waters	915pm-945pm	0:14	172
09/13/15	21:22	Phoenix North	1	Waters	915pm-945pm	-	-
09/13/15	22:13	Phoenix South	1	Waters	1015pm-1045pm	-	-
09/14/15	19:10	Phoenix South	1	Henz	Now-8pm	19:10	0
09/14/15	19:26	Scottsdale South	1	Henz	Now-830pm	19:43	17
09/14/15	19:46	Scottsdale North	1	Henz	Now-845pm	-	-
09/14/15	19:49	Phoenix North	1	Henz	Now-845pm	19:43	0
09/20/15	19:16	Gila Bend	2	Waters	8am 9/21-11pm 9/22	18:25 9/22	2829
09/20/15	19:16	Palo Verde	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Rainbow Valley	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	West Valley	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Northwest Valley	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Upper Centennial	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Wickenburg	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	New River/ Cave	2	Waters	8am 9/21-11pm 9/22	-	-

TABLE B-3: MSP Statement Lead Time - Monsoon Season 2015							
Statement Details						Statement Lead Time	
Date	LST	MSP Forecast Zone	Message	Forecaster	Valid Time	Alarm Triggered	Lead Time(min)
09/20/15	19:16	Sycamore Creek	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Phoenix North	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Phoenix South	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Scottsdale North	2	Waters	8am 9/21-11pm 9/22	18:13 9/22	2817
09/20/15	19:16	Scottsdale South	2	Waters	8am 9/21-11pm 9/22	17:57 9/22	2801
09/20/15	19:16	Southeast Valley	2	Waters	8am 9/21-11pm 9/22	19:10 9/22	2874
09/20/15	19:16	Lower Salt River	2	Waters	8am 9/21-11pm 9/22	-	-
09/20/15	19:16	Superstition	2	Waters	8am 9/21-11pm 9/22	-	-
09/21/15	12:17	Gila Bend	1	Waters	Now-2pm	-	-
09/22/15	17:55	Phoenix South	1	Waters	Now-630pm	-	-
09/22/15	17:55	Scottsdale North	1	Waters	Now-630pm	18:13	18
09/22/15	17:55	Scottsdale South	1	Waters	Now-630pm	17:57	3
09/22/15	18:05	Southeast Valley	1	Waters	Now-7pm	19:10	65
09/22/15	18:15	Superstition	1	Waters	Now-715pm	-	-
09/22/15	18:35	Gila Bend	3	Waters	Now-8pm	18:25	0
09/22/15	19:02	Southeast Valley	3	Waters	Now-9pm	19:10	7

APPENDIX C: MSP LAKE ALERTS - VERIFICATION TABLES

TABLE C-1: This table shows each of the individual MSP Lake Alerts issued during the 2015 Monsoon season. The table is broken down by statement Details, observations, and verification. The columns from left to right are defined as follows:

Statement Details – Message information including date, time issued in local standard time, lake, issuing forecaster, and valid time. Data is pulled directly from issued Message.

Observations – Rain information including forecast rainfall intensity and storm total precipitation where applicable. Data is pulled directly from issued Message. It is important to note that not all issued Messages contain forecast rainfall information (noted by an “N/A” in the table).

Lead Time – amount of lead time in minutes from when Lake Alert was issued to when first observation occurred.

Verification – Hits and misses were assigned based on thresholds previously discussed in the [MSP Verification Metrics and Criteria](#) section of this report.

TABLE C-1: MSP Lake Alerts Issued - Monsoon Season 2015									
Statement Details					Observations			Lead Time	Verification
Date	LST	Lake	Forecaster	Valid Time	Lightning	Wind > 30mph	Hail/Heavy Rain	1st Obs.	Hit/Miss
06/27/15	18:00	Bartlett	Henz	Now-7pm	x	x	x	15	Hit
06/27/15	18:00	Horseshoe	Henz	Now-7pm	x	x	-	15	Hit
06/27/15	18:14	Canyon	Henz	Now-7pm	x	x	-	13	Hit
06/27/15	18:14	Apache	Henz	Now-7pm	x	x	-	12	Hit
06/27/15	18:14	Saguaro	Henz	Now-7pm	x	x	-	13	Hit
06/28/15	17:27	Bartlett	Henz	Now-630pm	x	x	-	1	Hit
07/18/15	16:41	Pleasant	Waters	Now-530pm	-	x	-	0	Hit
07/29/15	18:15	Saguaro	Henz	Now-730pm	x	-	-	59	Hit
07/29/15	18:15	Canyon	Henz	Now-715pm	x	-	x	59	Hit
07/29/15	18:15	Apache	Henz	Now-7pm	x	-	x	0	Hit
07/31/15	13:18	Saguaro	Waters	Now-2pm	x	-	-	-	Hit
07/31/15	13:18	Canyon	Waters	Now-2pm	x	-	-	-	Hit
07/31/15	13:18	Apache	Waters	Now-2pm	x	-	-	-	Hit

TABLE C-1: MSP Lake Alerts Issued - Monsoon Season 2015

Statement Details					Observations			Lead Time	Verification
Date	LST	Lake	Forecaster	Valid Time	Lightning	Wind > 30mph	Hail/Heavy Rain	1st Obs.	Hit/Miss
07/31/15	13:29	Pleasant	Waters	Now-215pm	-	-	-	-	Miss
07/31/15	13:33	Bartlett	Waters	Now-315pm	-	-	x	-	Hit
08/07/15	16:48	Saguaro	Waters	5pm-6pm	x	-	-	-	Hit
08/07/15	16:48	Canyon	Waters	5pm-6pm	x	-	-	-	Hit
08/07/15	17:19	Bartlett	Waters	515pm-615pm	x	-	x	-	Hit
08/11/15	10:10	Pleasant	Henz	Now-1130am	-	x	x	28	Hit
08/11/15	10:10	Bartlett	Henz	Now-1130am	x	x	x	2	Hit
08/24/15	15:52	Bartlett	Henz	Now-5pm	x	x	-	8	Hit
08/24/15	17:38	Pleasant	Henz	Now-645pm	x	x	-	22	Hit
08/25/15	16:47	Apache	Henz	Now-6pm	x	x	x	0	Hit
08/25/15	16:47	Canyon	Henz	Now-6pm	x	x	-	45	Hit
08/25/15	17:39	Saguaro	Henz	Now-630pm	x	-	-	19	Hit
08/25/15	18:03	Bartlett	Henz	615pm-715pm	x	x	-	29	Hit
08/27/15	13:14	Bartlett	Henz	Now-215pm	x	x	x	0	Hit
08/27/15	13:28	Pleasant	Henz	Now-230pm	x	-	-	0	Hit
08/27/15	14:44	Saguaro	Henz	Now-345pm	-	-	-	-	Miss
08/27/15	14:44	Canyon	Henz	Now-345pm	x	-	-	-	Hit
08/27/15	14:44	Apache	Henz	Now-345pm	x	-	-	-	Hit
08/29/15	15:15	Canyon	Waters	Now-4pm	x	-	-	10	Hit
08/29/15	15:15	Apache	Waters	Now-4pm	x	-	-	10	Hit
08/29/15	18:45	Bartlett	Waters	Now-715pm	x	-	-	17	Hit
09/07/15	17:25	Pleasant	Henz	Now-630pm	x	-	-	-	Hit
09/08/15	18:12	Bartlett	Henz	Now-715pm	x	x	x	15	Hit
09/12/15	17:05	Bartlett	Waters	515pm-545pm	x	-	x	0	Hit
09/22/15	18:15	Saguaro	Waters	Now-7pm	x	-	x	-	Hit
09/22/15	18:15	Canyon	Waters	Now-7pm	x	-	x	-	Hit
09/22/15	18:15	Apache	Waters	Now-7pm	x	-	x	-	Hit

APPENDIX D: QPF PEAK RAINFALL INTENSITY - VERIFICATION TABLES

TABLE D-1: This table shows each of the individual qualifying MSP Messages issued during the 2015 Monsoon season including the detailed forecast rainfall information. The table is broken down by statement details, peak rainfall intensity, and verification. The columns from left to right are defined as follows:

Statement Details – Message information including date and forecast zone. Data is pulled directly from issued Message.

Peak Rainfall Intensity – Rain information including forecast and observed rainfall intensity. Observed rainfall intensities include rain gage type and number (if ALERT data). Data is pulled directly from issued Message. Observations are gathered the ALERT database and local storm reports.

Verification – Percent error, hits and misses were assigned based on thresholds previously discussed in the [MSP Verification Metrics and Criteria](#) section of this report.

TABLE D-1: MSP QPF Peak Intensity Verification - Monsoon Season 2015						
Statement Details		Peak Rainfall Intensity			Verification	
Date	MSP Forecast Zone	QPF (in/min)	Observed (in/min) *	Gage Type	(%) Error	Hit/Miss
18:40	Northwest Valley	0.50"/20min	0.63	ALERT 5450	-20.63	Hit
14:40	Gila Bend	0.50"/60min	0.39	GAQPE	28.21	Miss
16:49	Palo Verde	0.50"/30min	1.00	GAQPE	-50.00	Miss
13:45	Superstition	1.00"/60min	1.06	ALERT 6670	-5.66	Hit
14:20	Phoenix North	0.75"/30min	0.04	ALERT 5595	1775.00	Miss
14:20	Scottsdale North	0.75"/30min	0.79	ALERT 5915	-5.06	Hit
14:29	Wickenburg	1.00"/60min	1.18	ALERT 7070	-15.25	Hit
14:46	Phoenix South	0.75"/30min	0.67	ALERT 4700	11.94	Hit
14:46	Scottsdale South	0.50"/30min	0.00	-	-	Miss
14:46	Southeast Valley	0.50"/30min	0.39	GAQPE	28.21	Miss
15:32	West Valley	1.00"/60min	1.22	GAQPE	-18.03	Hit
15:32	Northwest Valley	0.75"/60min	0.79	GAQPE	-5.06	Hit
16:31	Rainbow Valley	0.50"/30min	0.51	ALERT 5400	-1.96	Hit

TABLE D-1: MSP QPF Peak Intensity Verification - Monsoon Season 2015						
Statement Details		Peak Rainfall Intensity			Verification	
Date	MSP Forecast Zone	QPF (in/min)	Observed (in/min) *	Gage Type	(%) Error	Hit/Miss
15:55	Palo Verde	0.50"/30min	0.43	ALERT 5030	16.28	Hit
22:13	Phoenix South	0.50"/30min	0.43	GAQPE	16.28	Hit
18:15	Superstition	1.00/60min	0.83	GAQPE	20.48	Hit
<i>* Data in the Observed column was fit to match QPF Intensity time scale.</i>						

APPENDIX E: QPF STORM TOTAL PRECIPITATION - VERIFICATION TABLES

TABLE E-1: This table shows each of the individual MSP Lake Alerts issued during the 2015 Monsoon season including the detailed forecast rainfall information. The table is broken down by statement Details, observations, and verification. The columns from left to right are defined as follows:

Statement Details – Message information including date and forecast zone. Data is pulled directly from issued Message.

Peak Storm Total Precipitation – Rain information including forecast (QPF), observed (ALERT), radar estimated (GAQPE), and local storm report total (LSR). Data is pulled directly from issued Message. Observations are gathered the ALERT database, WDT Inc radar products, and NWS local storm reports.

Error – Percent error was calculated based on Equation 4 previously discussed in the [MSP Verification Metrics and Criteria](#) section of this report.

Verification – Hits and misses were assigned based on thresholds previously discussed in the [MSP Verification Metrics and Criteria](#) section of this report.

TABLE E-1: MSP QPF Peak Storm Total Rainfall Verification - Monsoon Season 2015											
Statement Details		Peak STP (in)					Error (%)				Verification
Date	MSP Forecast Zone	QPF	ALERT	GAQPE (LT)	GAQPE (UT)	LSRs	ALERT	GAQPE (LT)	GAQPE (UT)	LSRs	Hit/Miss
06/29/15	Wickenburg	1.00	1.38	1.23	1.61	-	-27.54	-18.70	-37.89	-	Hit
06/29/15	Upper Centennial	1.00	0.51	0.64	0.83	-	96.08	56.25	20.48	-	Hit
07/06/15	Rainbow Valley	1.00	0.67	1.23	1.61	-	49.25	-18.70	-37.89	-	Hit
07/06/15	West Valley	1.00	0.83	1.23	1.61	-	20.48	-18.70	-37.89	-	Hit
07/06/15	Northwest Valley	1.00	0.28	0.64	0.83	-	257.14	56.25	20.48	-	Hit
07/06/15	Palo Verde	1.00	1.14	1.62	1.81	-	-12.28	-38.27	-44.75	-	Hit
07/18/15	Gila Bend	1.50	0.00	2.02	2.21	-	-	-25.74	-32.13	-	Miss
07/18/15	Rainbow Valley	0.60	0.59	0.64	0.83	-	1.69	-6.25	-27.71	-	Hit
07/18/15	West Valley	1.50	0.16	1.23	1.61	-	837.50	21.95	-6.83	-	Hit
07/18/15	Northwest Valley	1.50	0.75	1.23	1.61	-	100.00	21.95	-6.83	-	Hit
07/18/15	Wickenburg	0.75	4.21	2.87	3.19	-	-82.19	-73.87	-76.49	-	Miss
07/29/15	Lower Salt River Lakes	1.00	0.00	1.23	1.61	-	-	-18.70	-37.89	-	Hit

TABLE E-1: MSP QPF Peak Storm Total Rainfall Verification - Monsoon Season 2015

Statement Details		Peak STP (in)					Error (%)				Verification
Date	MSP Forecast Zone	QPF	ALERT	GAQPE (LT)	GAQPE (UT)	LSRs	ALERT	GAQPE (LT)	GAQPE (UT)	LSRs	Hit/Miss
07/31/15	Southeast Valley	0.75	1.06	1.03	1.22	-	-29.25	-27.18	-38.52	-	Miss
08/07/15	Southeast Valley	0.75	0.28	0.64	0.83	-	167.86	17.19	-9.64	-	Hit
08/07/15	Lower Salt River Lakes	0.50	0.00	0.25	0.43	-	#DIV/0!	100.00	16.28	-	Hit
08/07/15	Superstition	0.75	0.24	0.64	0.83	-	212.50	17.19	-9.64	-	Hit
08/07/15	Phoenix South	0.50	0.47	0.64	0.83	-	6.38	-21.88	-39.76	-	Hit
08/07/15	Scottsdale South	0.50	0.28	0.44	0.63	-	78.57	13.64	-20.63	-	Hit
08/11/15	Southeast Valley	0.50	0.63	0.84	1.02	0.50	-20.63	-40.48	-50.98	0.00	Hit
08/11/15	Scottsdale North	1.00	0.98	0.64	0.83	-	2.04	56.25	20.48	-	Hit
08/11/15	Northwest Valley	0.60	0.59	0.84	1.02	-	1.69	-28.57	-41.18	-	Hit
08/11/15	Wickenburg	1.00	1.10	1.03	1.22	-	-9.09	-2.91	-18.03	-	Hit
08/11/15	Southeast Valley	0.75	0.47	0.44	0.63	0.75	59.57	70.45	19.05	0.00	Hit
08/11/15	Phoenix South	0.50	0.12	0.04	0.24	-	316.67	1150.00	108.33	-	Miss
08/11/15	Scottsdale South	0.50	0.16	0.25	0.43	-	212.50	100.00	16.28	-	Hit
08/24/15	New River/ Cave Creek	0.70	0.75	0.84	1.02	-	-6.67	-16.67	-31.37	-	Hit
08/25/15	Southeast Valley	0.50	0.47	0.44	0.63	-	6.38	13.64	-20.63	-	Hit
08/25/15	Phoenix South	0.50	0.39	0.64	0.83	-	28.21	-21.88	-39.76	-	Hit
08/27/15	Northwest Valley	1.00	0.87	1.23	1.61	0.50	14.94	-18.70	-37.89	100.00	Hit
08/27/15	West Valley	1.00	1.46	1.23	1.61	-	-31.51	-18.70	-37.89	-	Hit
08/27/15	Phoenix North	0.50	0.31	0.44	0.63	-	61.29	13.64	-20.63	-	Hit
08/27/15	Phoenix South	1.00	0.31	1.03	1.22	-	222.58	-2.91	-18.03	-	Hit
08/27/15	Southeast Valley	1.00	0.98	0.84	1.02	1.00	2.04	19.05	-1.96	0.00	Hit
08/27/15	Northwest Valley	1.50	1.46	1.23	1.61	-	2.74	21.95	-6.83	-	Hit
08/27/15	Rainbow Valley	1.25	1.77	1.82	2.01	-	-29.38	-31.32	-37.81	-	Miss
08/31/15	Phoenix South	1.00	1.26	2.02	2.20	-	-20.63	-50.50	-54.55	-	Hit
08/31/15	Phoenix North	0.75	0.71	1.82	2.01	-	5.63	-58.79	-62.69	-	Hit
08/31/15	Scottsdale South	1.00	0.83	1.62	1.81	-	20.48	-38.27	-44.75	-	Hit
08/31/15	Southeast Valley	1.00	0.98	1.23	1.61	-	2.04	-18.70	-37.89	-	Hit
08/31/15	Superstition	0.50	0.35	0.44	0.63	-	42.86	13.64	-20.63	-	Hit
08/31/15	Scottsdale North	0.50	0.51	0.44	0.63	-	-1.96	13.64	-20.63	-	Hit

TABLE E-1: MSP QPF Peak Storm Total Rainfall Verification - Monsoon Season 2015

Statement Details		Peak STP (in)					Error (%)				Verification
Date	MSP Forecast Zone	QPF	ALERT	GAQPE (LT)	GAQPE (UT)	LSRs	ALERT	GAQPE (LT)	GAQPE (UT)	LSRs	Hit/Miss
08/31/15	New River/ Cave Creek	1.00	1.06	1.03	1.22	-	-5.66	-2.91	-18.03	-	Hit
09/03/15	Palo Verde	0.50	0.12	0.64	0.83	-	316.67	-21.88	-39.76	-	Hit
09/03/15	West Valley	0.50	0.04	0.04	0.24	-	1150.00	1150.00	108.33	-	Miss
09/08/15	Wickenburg	1.00	0.04	1.03	1.22	-	2400.00	-2.91	-18.03	-	Hit
09/13/15	Rainbow Valley	0.75	0.51	2.81	3.19	-	47.06	-73.31	-76.49	-	Miss
09/13/15	West Valley	0.75	0.71	1.62	1.81	-	5.63	-53.70	-58.56	-	Hit
09/13/15	Phoenix South	0.50	0.04	0.04	0.24	-	1150.00	1150.00	108.33	-	Miss
09/13/15	Northwest Valley	0.50	0.16	1.03	1.22	-	212.50	-51.46	-59.02	-	Miss
09/13/15	Phoenix North	0.50	0.47	0.64	0.83	-	6.38	-21.88	-39.76	-	Hit
09/14/15	Phoenix South	0.75	0.67	0.64	0.83	0.93	11.94	17.19	-9.64	-19.35	Hit
09/14/15	Scottsdale South	0.75	0.91	0.44	0.63	-	-17.58	70.45	19.05	-	Hit
09/14/15	Scottsdale North	0.30	0.31	0.25	0.43	-	-3.23	20.00	-30.23	-	Hit
09/14/15	Phoenix North	1.00	0.91	0.44	0.63	-	9.89	127.27	58.73	-	Hit
09/21/15	Gila Bend	0.75	0.51	0.84	1.02	-	47.06	-10.71	-26.47	-	Hit
09/22/15	Southeast Valley	0.75	1.46	1.82	2.01	0.50	-48.63	-58.79	-62.69	50.00	Miss
* GAQPE (Radar) estimated data given in ranges: (LT) Lower Total and (UT) Upper Total											