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RS-18-084 10 CFR 50.90

July 9, 2018

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Braidwood Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. 50-456 and 50-457

Subject: Response to Request for Additional Information Regarding Braidwood TORMIS Amendment Request

References:
1. Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. NRC, "License Amendment Request to Utilize TORMIS Computer Code Methodology," dated February 1, 2018
2. Email from J. Wiebe (U.S. NRC) to R. Sprengel (Exelon Generation Company, LLC), "Preliminary RAIs Regarding Braidwood TORMIS Amendment Request," dated May 30, 2018

In Reference 1, Exelon Generation Company, LLC (EGC) requested an amendment to Renewed Facility Operating License Nos. NPF-72 and NPF-77 for Braidwood Station, Units 1 and 2. In Reference 2, the NRC requested that EGC provide additional information to support their review of the subject License Amendment Request. Per discussion on June 6, 2018, a response was requested by July 9, 2018. The requested information is provided in Attachment 1.

EGC has reviewed the information supporting the No Significant Hazards Consideration and the Environmental Consideration that was previously provided to the NRC in Reference 1. The additional information provided in this submittal does not affect the conclusion that the proposed license amendment does not involve a significant hazards consideration. This additional information also does not affect the conclusion that neither an environmental impact statement nor an environmental assessment need be prepared in support of the proposed amendment.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), EGC is notifying the State of Illinois of this additional information by transmitting a copy of this letter and its attachment to the designated State Official.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this letter, please contact Ryan M. Sprengel at (630) 657-2814.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 9th day of July 2018.

Respectfully,

David M. Gullott
Manager – Licensing
Exelon Generation Company, LLC

Attachment 1: Response to Request for Additional Information

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Braidwood Station
Illinois Emergency Management Agency

ATTACHMENT 1

Response to Request for Additional Information

In Reference 1, Exelon Generation Company, LLC (EGC) requested an amendment to Renewed Facility Operating License Nos. NPF-72 and NPF-77 for Braidwood Station, Units 1 and 2. In Reference 2, the NRC requested that EGC provide additional information to support their review of the subject License Amendment Request. Per discussion on June 6, 2018, a response was requested by July 9, 2018. The requested information is provided below.

Request for Additional Information

The NRC requires that nuclear power plants be designed to withstand the effects of tornado and high-wind-generated missiles so as not to adversely impact the health and safety of the public in accordance with the requirements of General Design Criterion (GDC) 2, "Design Bases for Protection against Natural Phenomena," and GDC 4, "Environmental and Dynamic Effects Design Bases," of Appendix A, "General Design Criteria for Nuclear Power Plants," to Title 10 of the Code of Federal Regulations (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities."

The 1983 TORMIS safety evaluation report (SER) (ADAMS Accession No. ML080870291) approving the TORMIS methodology provides one way of meeting the above requirements. The SER requests licensees using the methodology to consider and address five points in their applications.

By letter dated February 1, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18036A227, Exelon Generation Company (the licensee) requested the U.S. Nuclear Regulatory Commission's (NRC) approval of a license amendment request (LAR) to revise the Braidwood Station Unit 1 & 2 licensing bases for protection from tornado-generated missiles. The NRC staff has identified areas in which additional information is needed to complete the Technical Review.

RAI 1

The licensee's LAR references Regulatory Information Summary (RIS) 2008-14, "Use of the TORMIS Computer Code for Assessment of Tornado Missile Protection," which includes reference to the 1983 TORMIS safety evaluation report (SER) (ADAMS Accession No. ML080870291). One concern mentioned in RIS 2008-14 is inappropriately limiting the number of targets modeled.

LAR Section 2.a contains a list of equipment not included in TORMIS analysis with supporting justification. One item is bullet specifying, "…For the Unit 2 AF Pump Diesel Engine Day Tank, the vent line has a different configuration; therefore, a revision was made to the Abnormal Operating Procedure to establish operator compensatory actions to address a potential vent line crimp due to a tornado missile impact."

Braidwood Unit 2 vent uses justification of updating AOP procedures to establish operator action. Addressing unprotected non-conforming SSC procedurally, with operator compensatory actions, is not typically accepted as adequate justification for not protecting components from tornado protection.

Provide a discussion on how these compensatory actions are defined to justify not protecting these components.

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Response:

Operator action to provide an alternate vent path for the 2B AF pump diesel engine day tank is directed in procedure 0BwOA ENV-1, Adverse Weather Conditions Unit 0. This procedure provides actions required during tornado, severe thunderstorm, sustained high wind, flood, or heavy rain conditions. The procedure directs day tank sight-glass vent valve 2DO118 to be uncapped and opened to provide an alternate day tank vent path if the normal vent path is obstructed. The single required action is performed in the 2B AF pump room located in an accessible portion of the Auxiliary building. An evaluation has determined that blockage greater than 98% of the pipe flow area is needed after crimping before impacting system operation. Pipe crimping due to a tornado missile is not expected to result in greater than 98% flow area blockage.

RAI 2

The LAR provides discussion on each of the five points requested to be addressed by the 1983 TORMIS safety evaluation report (SER) (ADAMS Accession No. ML080870291). One of the points in the TORMIS SER specifies that the user should provide sufficient information to justify the assumed missile density based on site specific missile sources and dominant tornado paths of travel.

The LAR includes the statement, "A detailed plant survey was performed during an outage to quantify the number of potential missiles. The Braidwood missile survey walkdown was performed by ARA using ARA's plant walkdown procedures. The survey walkdown uses a systematic, documented process to provide input on what missiles are in each missile zone, the minimum and maximum injection heights for all missiles by missile type, the building characteristics for structures in the missile zone, and pictures of the missiles and buildings surveyed. This information was developed into the plant modeling inputs for the TORMIS analysis. The mean number of potential missiles simulated for EF5 tornadoes was 383,420, including structural failure missile sources."

Missile count and details of development of origin zones depicting the representative type, quantity or density of zonal missiles was not provided. As a result, it's unclear how the missile count was derived. Therefore, the staff requests the licensee justify how the TORMIS SE was met and provide details of the assumed missile density based on location-specific missile counts used in the analysis.

Response:

Missile origin zones are defined based on review of overall site plans and aerial photos of the plant. Zone boundaries are arbitrarily defined by features such as roads, fence lines, edges of buildings, changes in land use, and homogeneity of areas. The result is thirty-nine (39) separate origin zones for the Main Site Model and seven (7) zones for the SX Model. These boundaries were used as the basis for the field missile surveys.

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A Cartesian coordinate system was created based on aerial photos and site plans of the plant. This coordinate system has units of feet (ft) and is oriented such that the plant and all missile zones are in positive X and Y coordinates throughout the model. The missile zones cover an area that extends out to a minimum of 2500 ft in all directions from the safety-related targets. The plant safety envelope, which envelopes all the safety-related targets, is a major target circle centered on the point (4825, 4695) with a radius of 400 ft.

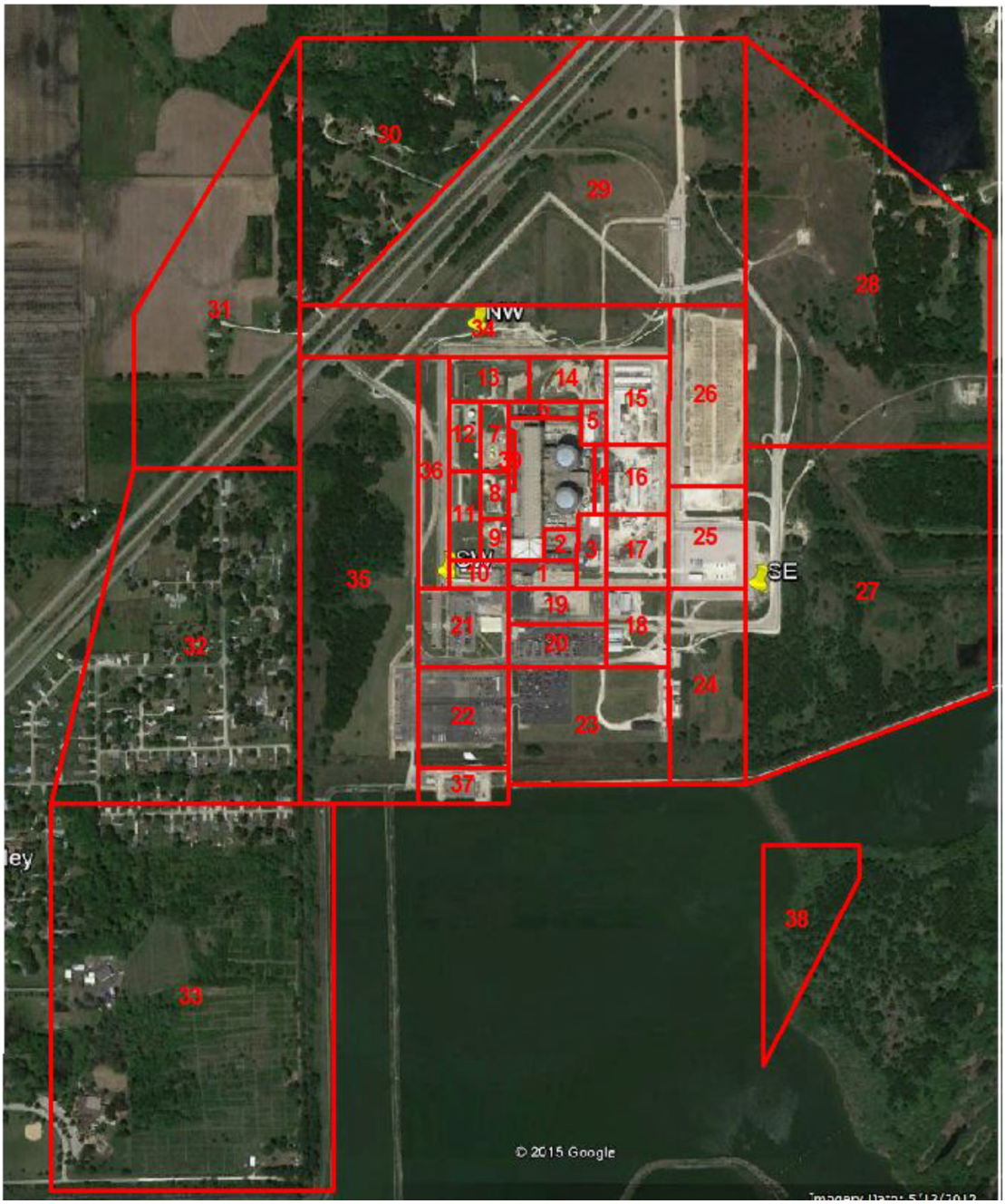

Figure 1-1 Zone Layout for Braidwood Station Main Site TORMIS Analysis

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Figure 1-1 shows the final missile zones defined for the analysis overlaid onto an aerial photo of the plant. The coordinates for the points that define the zones and zone connections are given in Attachment 1-1, Table 1 and Table 2. The number of missiles surveyed by zone is given in Table 3. The list of main site missile source targets with zone number is given in Table 4, and the number of missiles from missile source targets is given in Table 5. Note that missile source targets within the safety envelope given a location of Zone 0.

The Essential Service Water (SX) Model was developed using the same process to lay out the missile source zones. The SX Model is a separate model from the Main Site Model because the location of the SX discharge pipes in the middle of the Essential Cooling Pond (ECP) is nearly a mile away from the main site safety-significant targets. Figure 1-2 shows the final missile zones defined for the SX Model overlaid onto an aerial photo of the area, with the SX discharge pipes being shown in the blue rectangle. The plant safety envelope for the SX Model has the same area and shape as the envelope for the Main Site Model, but is centered on the SX discharge pipes.

The coordinates for the points that define the zones and the zone connections are given in Attachment 1-1, Table 6 and Table 7. The list of structural failure missile source targets is in Table 8 and the corresponding zonal and structural missile counts are found in Tables 9 and 10. Note that the structural missile source targets are all found in Zone 1 of the model.

Figure 1-2 Zone Layout for Braidwood Station SX Model TORMIS Analysis

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References

1. Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. NRC, "License Amendment Request to Utilize TORMIS Computer Code Methodology," dated February 1, 2018
2. Email from J. Wiebe (U.S. NRC) to R. Sprengel (Exelon Generation Company, LLC), "Preliminary RAIs Regarding Braidwood TORMIS Amendment Request," dated May 30, 2018

ATTACHMENT 1-1 Tables

Table 1 Coordinates of Points Defining Main Site Model Missile Zones

Point	X	Y
1	3277	1
2	1400	1
3	1400	2565
4	3277	2565
5	3050	2565
6	3838	2565
7	4440	2565
8	4440	2692
9	5506	2692
10	6013	2692
11	3838	2808
12	4440	2808
13	3838	3477
14	4440	3477
15	5082	3477
16	5500	3477
17	4440	3760
18	5082	3760
19	3838	3990
20	4440	3990
21	4892	4178
22	4892	3990

Point	X	Y
23	5082	3990
24	5500	3990
25	6013	3990
26	4040	3990
27	4040	4178
28	4252	4178
29	4440	4178
30	4670	4178
31	4670	4385
32	4895	4385
33	4252	4460
34	4440	4460
35	4895	4490
36	5082	4490
37	5500	4490
38	5500	4675
39	6013	4675
40	6125	2290
41	3050	4790
42	4040	4770
43	4252	4770
44	4915	4945

Point	X	Y
45	5082	4945
46	5500	4945
47	4040	5235
48	4579	5235
49	4915	5235
50	5082	5235
51	3050	5530
52	3838	5530
53	4040	5530
54	4579	5530
55	5082	5530
56	5506	5530
57	6013	4940
58	7630	4940
59	1950	4790
60	1950	5810
61	3050	5875
62	3280	5875
63	5506	5875
64	6013	5875
65	7630	6350
66	3050	7640

Point	X	Y
67	4440	5235
68	4950	7640
69	6013	7640
70	7630	3310
71	4440	4770
72	4252	5235
73	4440	5120
74	4915	5120
75	5005	4490
76	5005	4945
77	6125	830
78	6770	2080
79	6770	2290
80	4440	4645
81	4480	4645
82	4480	5040
83	4440	5040

ATTACHMENT 1-1 Tables

Table 2 Zone Connectivity to Define Main Site Model Missile Zones

Zone	Connectivity
1	20-22-21-29-20
2	30-21-32-31-30
3	22-23-36-35-22
4	75-36-45-76-75
5	44-45-50-49-44
6	73-74-49-67-73
7	43-71-67-72-43
8	33-34-71-43-33
9	28-29-34-33-28
10	26-20-29-27-26
11	27-28-43-42-27
12	42-43-72-47-42
13	47-48-54-53-47

Zone	Connectivity
14	48-50-55-54-48
15	45-46-56-55-45
16	36-37-46-45-36
17	23-24-37-36-23
18	15-16-24-23-15
19	17-18-23-20-17
20	14-15-18-17-14
21	13-14-20-19-13
22	11-12-14-13-11
23	7-9-16-14-7
24	9-10-25-24-9
25	24-25-39-38-24
26	38-39-64-63-38

Zone	Connectivity
27	10-70-58-57-10
28	57-58-65-69-57
29	62-64-69-68-62
30	61-62-68-66-61
31	59-41-66-60-59
32	3-4-41-59-3
33	1-5-3-2-1
34	51-56-63-61-51
35	4-6-52-51-4
36	19-26-53-52-19
37	6-7-12-11-6
38	77-78-79-40-77
39	80-81-82-83-80

ATTACHMENT 1-1 Tables

Table 3 Main Site Model Number of Missiles Surveyed by Missile Zone

Subset	Missile Description	Zone Number																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Rebar	12	20	0	2	0	0	3	4	0	0	10	0	6	22	11	8	0	150	0
2	Gas Cylinder	0	0	0	0	4	0	2	0	124	0	0	0	0	0	17	8	6	1	0
3	Drum Tank	0	0	0	0	0	0	2	87	198	0	0	0	0	4	188	18	16	1	0
4	Utility Pole	0	0	0	0	0	0	0	0	0	0	14	14	0	0	43	0	0	12	0
5	Cable Reel	0	0	0	0	0	0	0	0	1	0	0	0	0	0	14	5	57	0	0
6	Pipe 3in	60	4	70	119	262	38	126	73	69	58	43	84	17	2,303	180	149	190	232	144
7	Pipe 6in	0	0	0	0	0	0	0	0	0	8	0	0	4	0	43	8	18	50	0
8	Pipe 12in	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	1	14	12	0
9	Storage Bin	4	0	0	2	0	0	2	0	12	9	0	0	4	45	17	32	55	0	0
10	Concrete Fragment	0	0	0	0	0	0	0	0	3	0	0	0	4	0	136	184	4	300	0
11	Wood Beam	0	0	0	0	0	0	0	0	0	0	0	0	145	162	124	154	170	23	0
12	Wood Plank	0	0	0	0	3	0	0	0	12	0	0	0	0	244	180	130	140	0	0
13	Metal Siding	0	26	0	3	6	8	0	46	6	10	23	66	0	0	58	20	60	20	0
14	Plywood Sheet	7	0	0	0	0	0	0	0	18	0	0	0	60	77	101	158	39	18	0
15	Wide Flange	0	0	0	0	0	0	0	0	0	0	0	0	0	4	11	2	12	20	0
16	Channel Section	0	0	0	30	0	0	0	0	8	5	0	0	0	426	457	162	188	250	0
17	Small Equipment	1	4	3	7	6	2	3	0	4	4	0	0	12	5	113	48	8	0	0
18	Large Equipment	0	0	0	1	0	0	4	0	1	0	0	0	0	0	15	16	1	5	0
19	Steel Frame Grating	103	0	57	0	0	0	40	0	96	2	20	0	10	387	542	83	0	708	0
20	Large Steel Frame	0	0	2	0	0	0	0	0	26	0	0	0	0	3	18	26	0	8	0
21	Vehicle	13	0	2	3	4	5	5	0	7	9	0	0	2	4	43	6	18	9	40
22	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Precast Roof Deck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Missiles		**200**	**54**	**134**	**167**	**285**	**53**	**187**	**210**	**585**	**105**	**110**	**164**	**264**	**3,686**	**2,330**	**1,218**	**996**	**1,819**	**184**

ATTACHMENT 1-1 Tables

Table 3 Main Site Model Number of Missiles Surveyed by Missile Zone (Cont.)

Subset	Missile Description	Zone Number																			
		20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	Total
1	Rebar	0	35	0	0	310	0	0	0	0	0	0	0	0	0	0	0	0	2	0	80	675
2	Gas Cylinder	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	5	0	0	171
3	Drum Tank	0	0	1	0	0	20	0	0	0	0	0	0	0	0	0	0	0	3	0	0	538
4	Utility Pole	0	10	10	0	0	0	20	0	0	40	10	40	0	0	20	20	0	0	0	0	253
5	Cable Reel	0	0	0	0	11	60	0	0	0	0	0	0	0	0	0	2	0	2	0	0	152
6	Pipe 3in	20	0	250	143	168	273	329	151	134	97	60	0	240	0	324	9	312	854	0	240	7,825
7	Pipe 6in	0	0	0	0	0	4	0	0	10	0	0	0	0	0	0	0	20	12	0	0	177
8	Pipe 12in	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
9	Storage Bin	0	2	10	0	35	60	0	0	0	0	0	0	0	0	0	0	0	10	0	5	304
10	Concrete Fragment	0	0	120	0	280	280	0	0	0	0	0	0	80	0	0	0	20	2	0	0	1,413
11	Wood Beam	0	0	344	0	180	80	0	0	40	0	80	0	60	15	40	60	4	0	0	5	1,686
12	Wood Plank	0	0	0	0	1,040	160	0	0	20	0	160	0	180	15	10	40	20	0	0	5	2,359
13	Metal Siding	0	0	0	0	0	0	0	0	80	0	0	0	0	0	0	0	10	20	0	0	462
14	Plywood Sheet	0	0	0	0	96	0	0	0	60	0	20	0	0	40	0	24	2	0	0	40	760
15	Wide Flange	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87
16	Channel Section	0	0	160	0	66	40	0	0	0	0	0	0	0	0	0	0	0	240	0	0	2,032
17	Small Equipment	0	0	0	0	60	5	0	0	0	0	0	0	0	0	0	0	0	5	0	0	290
18	Large Equipment	0	0	5	0	75	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	132
19	Steel Frame Grating	0	0	0	0	648	100	0	0	0	0	0	0	0	0	0	0	0	0	0	200	2,996
20	Large Steel Frame	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86
21	Vehicle	284	112	563	318	35	4	0	0	0	0	0	0	0	0	0	45	0	4	0	1	1,536
22	Tree	0	0	0	28	125	0	0	4,768	2,193	548	2,604	721	1,602	5,732	88	2,404	0	0	695	0	21,508
23	Precast Roof Deck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Missiles		**304**	**159**	**1,463**	**489**	**3,185**	**1,090**	**349**	**4,919**	**2,537**	**685**	**2,934**	**761**	**2,162**	**5,802**	**482**	**2,604**	**388**	**1,168**	**695**	**576**	**45,503**

ATTACHMENT 1-1 Tables

Table 4 List of Main Site Model Missile Source Targets

TORMIS Target #	Target Description	X Origin	Y Origin	Zone
111	Gate House	4468	4015	1
112	Gate House 2	4523.1	4015	1
113	Service Building Add 1	4679	4153	1
114	Service Building Add 2	4774.4	4153	1
115	Fukushima Trailer	4910	4168	3
116	CA Facility Unit 2	4980	4402	3
117	IEMA Building	4990	4622	0
118	CA Facility Unit 1	4943	4622	0
119	Old Building	5050	5005	5
120	Engineered Frame	4380	5167	7
121	Gas Storage Area	4380	5000	7
122	Waste Treatment Building	4297	4496	8
123	Storage Shed-9	4330	4265	9
124	Warehouse-10	4125	4095	10
125	Receiving Building	4330	4015	10
126	Decontamination Facility	5015	5340	14
127	Supply Warehouse 1	5140	5275	15
128	Supply Warehouse 2	5140	5360	15
129	Supply Warehouse 3	5140	5425	15
130	Exelon	5150	4915	16
131	Exelon A	5190.1	5205	15
132	Exelon B	5190.1	5050	15
133	Exelon C	5190.1	5150	15
134	Office-15	5390	5155	15
135	Office-16-1	5090	4585	16
136	Office-16-2	5090	4612	16
137	Office-16-3	5090	4660	16
138	Warehouse-16	5245	4535	16
139	Warehouse-Attachment	5296	4695	16
140	Shed-17	5185	4155	17
141	Warehouse-485	5330	4235	17

TORMIS Target #	Target Description	X Origin	Y Origin	Zone
142	Iron Fab Shop	5100	4375	17
143	Garage	5110	3865	18
144	Central Warehouse	5190	3835	18
145	Warehouse-18-1	5105	3656	18
146	Warehouse-18-2	5100	3565	18
147	Shop-To Be Removed	5465	3480	18
148	Access	4495	3695	20
149	New Training Facility	3935	3580	21
150	Training Shop	3935	3911	21
151	Fit for Duty	4260	3695	21
152	Security Screening	4415	3525	21
153	Fukushima Building	5310	3405	23
154	Trailer-24	5540	3335	24
155	Salt Shed	5550	3165	24
156	ISFSI Storage	5630	4040	25
157	Building-25	5620	4650	25
158	Switch Yard House 1	5615	4870	26
159	Switch Yard House 2	5610	4740	26
160	Checkpoint	5520	6360	29
161	North Houses-30	4240	7305	30
162	Mid Houses-30	3400	6940	30
163	South Houses-30	3310	6315	30
164	Houses-31	2930	7220	31
165	Single House-31	2635	5710	31
166	North Houses-32	2475	4020	32
167	East Houses-32	2590	3070	32
168	West Houses-32	1865	3220	32
169	Houses-33	2370	2365	33
170	Yoga Building	1635	1325	33
171	Park Sheds	1545	1440	33
172	Public Water	1760	1330	33

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Table 4 List of Main Site Model Missile Source Targets (Cont.)

TORMIS Target #	Target Description	X Origin	Y Origin	Zone
173	BBall Building	1645	410	33
174	Clubhouse	2715	155	33
175	Trailer-33	3030	150	33
176	House-33	2990	190	33
177	Screening House	4020	2605	37
178	U2 Operating Floor	4540	4325	0
179	U1 Operating Floor	4540	4712	0
180	TSC Roof	4475	5057.2	0
181	Operating Building	4550	4690	0
182	U2 Building Operating Floor	4570	4345	0
183	Radwaste	4685	4250	2
184	Outage-3	4985	4180	3
185	Outage Trailers-4	4970	4790	0
186	Outage Trailer-17	5165	4180	17
187	East Wall TB 1	4669.9	4325	0
188	West Wall TB	4540	4325	0
189	North Wall TB	4540.2	5057	0
190	South Wall TB	4540.2	4324.9	0

TORMIS Target #	Target Description	X Origin	Y Origin	Zone
190	South Wall TB	4540.2	4324.9	0
191	U1 RB Cladding	4763.3	4499.5	0
192	U2 RB Cladding	4763.3	4780	0
193	Service Building	4455	4179.9	0
194	TB Roof	4540	4325	0
195	Houses-28	7070	6565	28
196	Train Car Shed	4937.2	4760.1	0
197	Fukushima-3	4775	4250	2
198	Outage Trailers-2	4775	4295	2
199	Outage Trailer-22	4210	3000	22
200	East Wall TB 2	4669.9	4510	0
201	East Wall TB 3	4669.9	4923.5	0
202	Contractors Facility	4445	4535	0
203	Heater Bay Roof	4489.9	4465	0
204	South West TB	4490	4324.9	0
205	ISFSI Warehouse	5630	4190	25

ATTACHMENT 1-1 Tables

Table 5 Total Number of Missiles Modeled for Each Main Site Model Missile Source Target

Subset	Missile Description	Missile Source Target Number																		
		111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129
1	Rebar	315	279	509	516	65	146	39	146	56	13	0	0	0	1,811	85	0	145	147	154
2	Gas Cylinder	0	0	0	0	0	12	0	12	0	0	179	0	371	9	10	0	2	1	10
3	Drum Tank	0	0	0	0	0	6	0	6	0	0	0	2	0	6	8	0	39	118	29
4	Utility Pole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Cable Reel	0	0	0	0	0	0	0	0	0	0	0	0	0	142	6	0	89	37	39
6	Pipe 3in	0	0	0	0	0	0	0	0	0	0	0	132	0	310	0	0	122	4	0
7	Pipe 6in	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	12	4	0
8	Pipe 12in	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4	26	0
9	Storage Bin	22	20	36	36	5	21	3	21	4	1	0	5	0	527	17	0	21	24	68
10	Concrete Fragment	0	0	0	0	0	0	0	0	2,430	788	1,485	4	1,350	0	0	0	52	0	0
11	Wood Beam	88	78	142	144	71	21	11	21	16	4	0	0	0	72	10	0	460	862	20
12	Wood Plank	395	350	639	648	367	125	49	125	70	17	0	0	0	272	60	0	1,292	764	183
13	Metal Siding	130	226	602	341	73	545	43	545	3	1	0	219	25	944	349	155	704	564	564
14	Plywood Sheet	44	39	71	72	105	0	6	0	8	2	0	0	0	180	212	0	904	1,179	164
15	Wide Flange	69	63	157	102	3	59	10	59	3	1	3	16	4	96	39	20	63	74	63
16	Channel Section	53	48	72	60	0	135	16	135	0	0	7	99	10	268	81	40	179	200	137
17	Small Equipment	12	11	19	18	3	14	2	14	3	1	0	0	0	356	53	0	504	339	39
18	Large Equipment	5	4	8	6	2	10	1	10	2	1	0	0	0	64	31	0	234	207	0
19	Steel Frame Grating	0	0	0	0	0	0	0	0	0	0	0	0	0	555	220	0	235	278	39
20	Large Steel Frame	0	0	0	0	0	0	0	0	0	0	0	0	0	187	17	0	54	76	10
21	Vehicle	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	2	5	0
22	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Precast Roof Deck	0	0	0	0	0	0	0	0	0	0	0	141	0	0	0	0	0	0	0
Total Missiles		**1,133**	**1,118**	**2,255**	**1,943**	**694**	**1,098**	**180**	**1,098**	**2,595**	**829**	**1,674**	**618**	**1,760**	**5,820**	**1,198**	**215**	**5,117**	**4,909**	**1,519**

ATTACHMENT 1-1 Tables

Table 5 Total Number of Missiles Modeled for Each Main Site Model Missile Source Target (Cont.)

Subset	Missile Description	Missile Source Target Number																		
		130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148
1	Rebar	611	117	93	31	0	18	65	65	255	16	0	124	164	51	201	104	96	0	0
2	Gas Cylinder	0	0	0	0	0	0	0	0	32	1	0	8	15	28	4	5	6	0	0
3	Drum Tank	0	0	0	0	0	0	0	0	56	3	0	24	2	11	42	6	18	0	0
4	Utility Pole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Cable Reel	0	0	0	0	0	0	0	0	29	4	0	31	7	6	5	0	24	0	0
6	Pipe 3in	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	40	0	0	0
7	Pipe 6in	0	0	0	0	0	0	0	0	44	0	0	0	3	9	30	0	0	0	0
8	Pipe 12in	0	0	0	0	0	0	0	0	15	0	0	0	5	3	0	0	0	0	0
9	Storage Bin	43	9	7	3	0	2	5	5	56	7	0	55	53	53	80	5	42	0	0
10	Concrete Fragment	0	0	0	0	0	0	0	0	34	0	0	0	0	7	0	0	0	0	0
11	Wood Beam	171	33	26	9	0	27	65	65	48	2	0	16	58	24	146	693	193	0	0
12	Wood Plank	767	146	117	39	0	133	341	341	291	19	0	148	261	120	463	1,581	1,123	0	0
13	Metal Siding	664	137	118	56	33	35	61	61	692	77	17	434	390	536	494	392	392	568	73
14	Plywood Sheet	86	17	13	5	0	28	105	105	123	17	0	132	0	113	110	992	294	0	0
15	Wide Flange	109	22	19	9	11	1	3	3	105	9	2	48	46	71	54	0	0	70	9
16	Channel Section	185	37	31	14	24	0	0	0	209	18	4	107	77	127	44	0	0	131	19
17	Small Equipment	29	6	5	2	0	1	3	3	77	4	0	31	44	61	168	66	24	0	0
18	Large Equipment	15	3	3	1	0	1	2	2	20	0	0	0	26	15	180	55	0	0	0
19	Steel Frame Grating	0	0	0	0	0	0	0	0	164	4	0	31	0	28	190	0	24	0	0
20	Large Steel Frame	0	0	0	0	0	0	0	0	12	1	0	8	0	5	10	0	6	0	0
21	Vehicle	0	0	0	0	0	0	0	0	0	0	0	0	0	12	15	5	0	0	0
22	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Precast Roof Deck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Missiles		**2,680**	**527**	**432**	**169**	**68**	**246**	**650**	**650**	**2,262**	**182**	**23**	**1,197**	**1,151**	**1,300**	**2,236**	**3,944**	**2,242**	**769**	**101**

ATTACHMENT 1-1 Tables

Table 5 Total Number of Missiles Modeled for Each Main Site Model Missile Source Target (Cont.)

Subset	Missile Description	Missile Source Target Number																		
		149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167
1	Rebar	1,987	152	602	0	0	20	0	0	0	0	0	0	2,580	2,236	258	602	258	2,823	2,848
2	Gas Cylinder	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Drum Tank	0	9	0	0	2	0	0	14	0	0	0	0	0	0	0	0	0	0	0
4	Utility Pole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Cable Reel	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0
6	Pipe 3in	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Pipe 6in	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Pipe 12in	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Storage Bin	139	10	42	0	5	2	0	9	0	0	0	0	180	156	9	42	18	208	216
10	Concrete Fragment	0	0	0	0	0	0	0	0	864	2,250	3,038	0	0	0	18	0	0	0	0
11	Wood Beam	555	27	168	0	0	30	0	0	0	0	0	0	2,548	2,172	282	590	248	3,055	3,160
12	Wood Plank	2,495	124	756	0	0	148	0	0	0	0	0	0	13,424	11,472	1,464	3,112	1,312	15,828	16,294
13	Metal Siding	637	240	581	103	350	39	142	345	34	51	40	115	120	104	12	28	12	1,037	1,310
14	Plywood Sheet	278	0	84	0	0	32	0	46	0	0	0	0	5,650	4,742	681	1,299	536	6,281	6,313
15	Wide Flange	226	35	99	31	44	1	18	42	1	7	6	33	120	104	12	28	12	137	140
16	Channel Section	304	58	170	68	93	0	33	80	3	21	17	73	0	0	0	0	0	0	0
17	Small Equipment	70	64	28	0	10	1	0	10	0	0	0	0	96	80	12	22	9	128	134
18	Large Equipment	24	20	14	0	20	1	0	0	0	0	0	0	36	28	6	8	3	62	70
19	Steel Frame Grating	0	40	0	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0
20	Large Steel Frame	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
21	Vehicle	0	0	0	0	6	0	0	3	0	0	0	0	0	0	0	0	0	0	0
22	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Precast Roof Deck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Missiles		**6,715**	**784**	**2,544**	**202**	**535**	**274**	**193**	**598**	**902**	**2,329**	**3,101**	**221**	**24,754**	**21,094**	**2,754**	**5,731**	**2,408**	**29,559**	**30,485**

ATTACHMENT 1-1 Tables

Table 5 Total Number of Missiles Modeled for Each Main Site Model Missile Source Target (Cont.)

Subset	Missile Description	Missile Source Target Number																		
		168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186
1	Rebar	2,294	3,255	140	78	234	2,477	98	43	66	15	0	0	346	124	52	32	0	0	0
2	Gas Cylinder	0	0	0	6	17	0	0	0	0	7	5	5	21	0	0	2	0	0	0
3	Drum Tank	0	0	0	16	23	0	0	0	0	6	22	10	63	0	0	6	0	0	0
4	Utility Pole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Cable Reel	0	0	0	20	0	0	0	0	0	0	0	0	84	0	0	8	0	0	0
6	Pipe 3in	0	0	0	0	0	0	0	0	0	120	80	280	0	0	0	0	0	0	0
7	Pipe 6in	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Pipe 12in	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Storage Bin	166	243	10	34	13	173	7	3	6	60	35	20	147	9	4	14	0	0	0
10	Concrete Fragment	0	0	0	0	7,448	0	0	0	0	0	0	0	50	0	0	0	0	0	0
11	Wood Beam	2,346	3,669	39	10	62	692	28	47	66	0	0	0	42	104	15	4	0	0	0
12	Wood Plank	12,276	18,909	176	92	280	3,111	123	241	346	0	0	0	399	511	65	38	0	0	0
13	Metal Siding	288	831	157	410	205	749	137	48	4	789	0	0	946	109	84	111	0	0	0
14	Plywood Sheet	5,091	8,148	20	82	20	346	14	69	162	0	0	0	357	110	8	34	0	0	0
15	Wide Flange	108	156	26	48	49	260	21	2	4	218	0	0	186	6	13	24	0	0	0
16	Channel Section	0	0	44	92	91	346	35	0	0	187	0	0	105	0	18	20	0	0	0
17	Small Equipment	90	156	7	20	39	87	5	2	4	70	0	0	79	5	2	8	0	0	0
18	Large Equipment	40	87	4	0	17	29	3	1	2	0	0	0	0	2	1	0	0	0	0
19	Steel Frame Grating	0	0	0	20	91	0	0	0	0	20	0	0	104	0	0	8	0	0	0
20	Large Steel Frame	0	0	0	6	4	0	0	0	0	9	0	1	21	0	0	2	0	0	0
21	Vehicle	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	2	1
22	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Precast Roof Deck	0	0	0	0	0	0	0	0	0	1,158	0	0	657	0	0	122	0	0	0
Total Missiles		**22,699**	**35,454**	**623**	**934**	**8,633**	**8,270**	**471**	**456**	**660**	**2,661**	**142**	**316**	**3,607**	**980**	**262**	**433**	**1**	**2**	**1**

ATTACHMENT 1-1 Tables

Table 5 Total Number of Missiles Modeled for Each Main Site Model Missile Source Target (Cont.)

Subset	Missile Description	Missile Source Target Number																			
		187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	Total
1	Rebar	0	0	0	0	0	0	1,372	0	1,332	46	18	0	0	0	0	144	0	112	148	33,229
2	Gas Cylinder	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	10	0	7	5	803
3	Drum Tank	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	14	0	21	15	606
4	Utility Pole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Cable Reel	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	28	20	601
6	Pipe 3in	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,108
7	Pipe 6in	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0	168
8	Pipe 12in	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	72
9	Storage Bin	0	0	0	0	0	0	96	0	94	21	2	0	0	0	0	8	0	49	39	3,545
10	Concrete Fragment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	19,832
11	Wood Beam	0	0	0	0	0	0	383	0	1,294	6	27	0	0	0	0	38	0	14	30	25,347
12	Wood Plank	0	0	0	0	0	0	1,723	0	6,832	55	133	0	0	0	0	172	0	133	180	123,470
13	Metal Siding	616	2,434	431	172	759	759	2,050	0	62	306	35	0	0	505	444	269	0	849	358	31,480
14	Plywood Sheet	0	0	0	0	0	0	192	0	2,806	49	28	0	0	0	0	12	0	119	93	48,828
15	Wide Flange	0	0	0	0	0	0	537	0	62	65	1	0	0	0	0	47	0	147	43	4,614
16	Channel Section	0	0	0	0	0	0	319	0	0	29	0	0	0	0	0	82	0	70	81	5,006
17	Small Equipment	0	0	0	0	0	0	64	0	47	12	1	0	0	0	0	24	0	28	22	3,348
18	Large Equipment	0	0	0	0	0	0	32	0	17	0	1	0	0	0	0	10	0	0	2	1,448
19	Steel Frame Grating	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	56	0	28	20	2,193
20	Large Steel Frame	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2	0	7	5	459
21	Vehicle	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	0	0	0	68
22	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Precast Roof Deck	0	0	0	0	0	0	1,994	5,948	0	180	0	0	0	0	0	0	1,850	0	0	12,050
	Total Missiles	**616**	**2,434**	**431**	**172**	**759**	**759**	**8,762**	**5,948**	**12,546**	**808**	**246**	**5**	**1**	**505**	**444**	**926**	**1,850**	**1,612**	**1,061**	**318,275**

ATTACHMENT 1-1 Tables

Table 6 Coordinates of Points Defining SX Model Missile Zones

Point	X	Y
1	4100	4710
2	5590	4710
3	5590	6875
4	4560	6240
5	7425	1950
6	7545	3890
7	9450	3890
8	8640	2680
9	9005	6215

Point	X	Y
10	8255	6400
11	8255	3890
12	5590	6020
13	8255	6020
14	4100	1950
15	7491.2	3020
16	4100	3020
17	8255	4710

Table 7 Zone Connectivity to Define SX Model Missile Zones

Zone	Connectivity
1	1-2-3-4-1
2	5-6-7-8-5
3	7-9-10-11-7
4	12-13-10-3-
5	14-5-15-16-
6	16-15-6-1-
7	2-17-13-12-

Table 8 List of SX Model Missile Source Targets

TORMIS Target #	Target Description	Zone
17	Clubhouse	1
18	Trailer-1	1
19	House-1	1
20	Screening House	1

ATTACHMENT 1-1 Tables

Table 9 SX Model Number of Missiles Surveyed by Missile Zone

Subset	Missile Description	Zone Number							
		1	2	3	4	5	6	7	Total
1	Rebar	0	0	0	2	2	0	0	4
2	Gas Cylinder	0	0	0	5	5	0	0	10
3	Drum Tank	0	0	0	4	4	0	0	8
4	Utility Pole	0	0	0	10	10	0	0	20
5	Cable Reel	0	0	0	2	2	0	0	4
6	Pipe 3in	0	0	0	1,104	1,104	0	0	2,208
7	Pipe 6in	0	0	0	12	12	0	0	24
8	Pipe 12in	0	0	0	0	0	0	0	0
9	Storage Bin	0	0	0	20	20	0	0	40
10	Concrete Fragment	0	0	0	122	122	0	0	244
11	Wood Beam	15	0	0	344	344	0	0	703
12	Wood Plank	15	0	0	0	0	0	0	15
13	Metal Siding	0	0	0	20	20	0	0	40
14	Plywood Sheet	40	0	0	0	0	0	0	40
15	Wide Flange	0	0	0	0	0	0	0	0
16	Channel Section	0	0	0	400	400	0	0	800
17	Small Equipment	0	0	0	5	5	0	0	10
18	Large Equipment	0	0	0	14	14	0	0	28
19	Steel Frame Grating	0	0	0	0	0	0	0	0
20	Large Steel Frame	0	0	0	0	0	0	0	0
21	Vehicle	0	0	0	567	567	1	1	1,136
22	Tree	2,025	3,896	2,080	0	0	0	0	8,001
23	Precast Roof Deck	0	0	0	0	0	0	0	0
Total Missiles		**2,095**	**3,896**	**2,080**	**2,631**	**2,631**	**1**	**1**	**13,335**

ATTACHMENT 1-1 Tables

Table 10 Total Number of Missiles Modeled for Each SX Model Missile Source Target

Subset	Missile Description	Missile Source Target Number				
		17	18	19	20	Total
1	Rebar	183	129	99	45	456
2	Gas Cylinder	0	0	0	21	21
3	Drum Tank	0	0	0	18	18
4	Utility Pole	0	0	0	0	0
5	Cable Reel	0	0	0	0	0
6	Pipe 3in	0	0	0	360	360
7	Pipe 6in	0	0	0	0	0
8	Pipe 12in	0	0	0	0	0
9	Storage Bin	15	9	9	180	213
10	Concrete Fragment	0	0	0	0	0
11	Wood Beam	51	141	99	0	291
12	Wood Plank	228	723	519	0	1,470
13	Metal Siding	183	69	6	1,044	1,302
14	Plywood Sheet	27	207	243	0	477
15	Wide Flange	45	6	6	654	711
16	Channel Section	72	0	0	561	633
17	Small Equipment	9	6	6	210	231
18	Large Equipment	6	3	3	0	12
19	Steel Frame Grating	0	0	0	60	60
20	Large Steel Frame	0	0	0	27	27
21	Vehicle	0	0	0	6	6
22	Tree	0	0	0	0	0
23	Precast Roof Deck	0	0	0	3,474	3,474
Total Missiles		**819**	**1,293**	**990**	**6,660**	**9,762**