

The Oregon Department of Geology and Mineral Industries (DOGAMI) has been identifying and mapping the tsunami inundation hazard along the Oregon coast since 1994. In Oregon, DOGAMI manages the National Tsunami Hazard Mitigation Program, which has been administered by the National Oceanic and Atmospheric Administration (NOAA) since 1995. DOGAMI's work is designed to help cities, counties, and other sites in coastal areas reduce the potential for disastrous tsunami-related consequences by understanding and mitigating this geologic hazard. Using federal funding awarded by NOAA, DOGAMI has developed a new generation of tsunami inundation maps to help residents and visitors along the entire Oregon coast prepare for the next Cascadia Subduction Zone (CSZ) earthquake and tsunami, as well as for far-travelled, or "distant" tsunamis.

This tsunami inundation map displays the output of computer models representing the two selected tsunami scenarios: Alaska M9.2 (1964) and the Alaska Maximum. All tsunami simulations were run assuming that prevailing tide was static (no flow) and equal to Mean Higher High Water (MHHW) tide; MHHW is defined as the average height of the higher high tides observed over an 18-year period at the Port Orford tide gauge. The map legend depicts the respective amounts of deformation and the earthquake magnitude for these two scenarios. Figure 3 shows the cumulative number of buildings inundated within the map area.

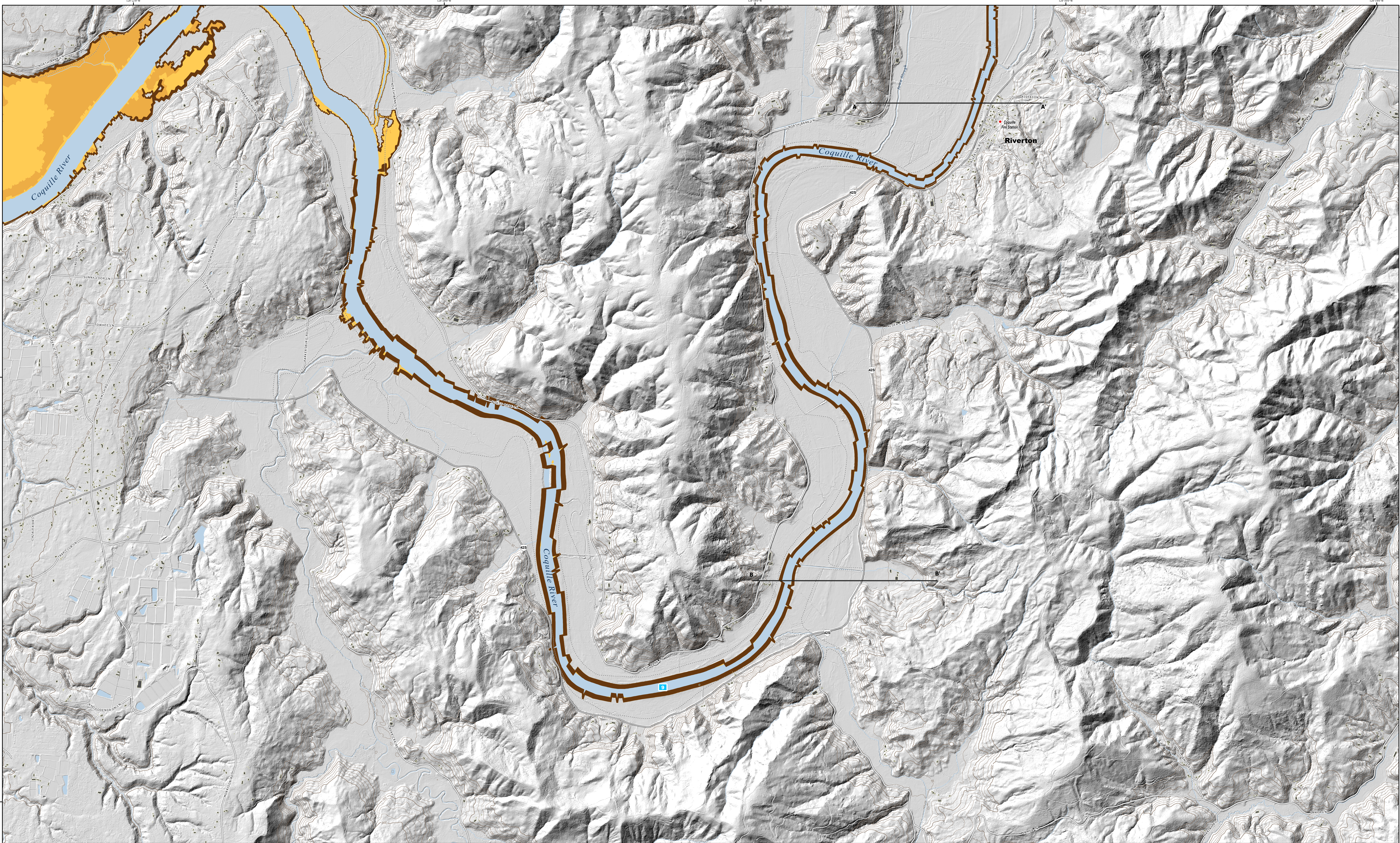
The computer simulation model output is provided to DQGAMI as millions of points with values that indicate whether the location of each point is wet or dry. These points are converted to wet and dry contour lines that form the extent of inundation. The transition area between the wet and dry contour lines is termed the *Wet/Dry Zone*, which equates to the amount of error in the model when determining the maximum inundation for the each scenario. Only the Alaska Maximum Wet/Dry Zone is shown on this map.

The "Ring of Fire," also called the Giron-Pacific belt, is the zone of earthquake activity surrounding the Pacific Ocean. It is an arc stretching from New Zealand, along the eastern edge of Asia, north across the Aleutian Islands of Alaska, and south along the coast of North and South America (Figure 1). The Ring of Fire is located at the borders of the Pacific Plate and other major tectonic plates. The Pacific Plate is colliding with and sliding underneath other plates creating subduction zones that eventually release energy in the form of an earthquake rupture. This rupture causes a vertical displacement of water that creates a tsunami. When these events occur around the Ring of Fire but not directly off the Oregon coast, they take more time to travel the Pacific Ocean and arrive onshore in Oregon (Figure 2). Distant earthquake/tsunami events have affected the Oregon coast; for example, offshore Alaska in 1964 and offshore Japan in March 2011.

Historically, about 28 distinct tsunamis have been documented by Oregon tide gauges since 1854. The most severe was generated by the 1964 M9.2 Prince William Sound earthquake in Alaska. Oregon was hit by the tsunami, which killed four people and caused an estimated 750,000 to 1 million dollars in damage to bridges, houses, cars, boats, and sea walls. The greatest tsunami damage in Oregon does not occur along the ocean front as one might expect, but in the estuary channels located further inland. Of the communities affected, Seaside was inundated by a 10 foot tsunami wave and was the hardest hit. Tsunami wave heights reached 10 to 11.5 feet in the Nehalem River, 10 to 11.5 feet at Depoe Bay, 11.5 feet at Newport, 10 to 11 feet at Florence, 11 feet at Reedsport, 11 feet at Brookings, and 14 feet at Coos Bay (Witter and others 2011).

Albedo-Attenuation (A) Specifications: DOGAMI modeled two distant earthquake and tsunami scenarios involving M9.2 earthquakes originating near the Gulf of Alaska. The first scenario attempts to replicate the 1964 Prince William Sound event, and the second scenario represents a hypothetical maximum event. This maximum event is the same model used by the U.S. Geological Survey (USGS) in their 2006 tsunami hazard assessment of Seattle (TPSW; 2006). This model uses extreme fault model parameters that result in maximum seafloor uplift, nearly twice as large as in the 1964 earthquake. The selected source location on the Aleutian chain of islands also shows the largest potential tsunami runup along the coast near Aleutian source locations. For these reasons the hypothetical "Alaska Maximum" scenario is selected as the worst case distant tsunami scenario for Oregon. Detailed information on fault geometries, subsidence, computer models, and the methodology used to create the two tsunami scenarios presented on this map can be found in DOGAMI Special Paper 43 (Witter and others, 2011).

2012



	Entire Map Area	Unincorporated Areas
Total Buildings	1,269	1,260
Buildings within Tsunami Zones*		
Alaska MS-2 (1964)	6	6
Alaska Maximum	8	8
Percent of Buildings within Tsunami Zones		
Alaska MS-2 (1964)	0.5%	0.5%
Alaska Maximum	0.6%	0.6%

*Building counts shown are based on polygon centroids and are cumulative within the map area.

Figure 3: The table and chart show the number of buildings inundated for the Alaska M9.2 (1964) and the Alaska Maximum tsunami scenarios for cities and unincorporated portions of the map.

Change in water level for two tsunami scenarios at the simulated gauge station shown on the map

Time since Earthquake (hours)	Alaska M9.2 (1964) Elevation (feet)	Alaska Maximum Elevation (feet)
0.0	7.5	8.5
1.0	7.5	8.5
2.0	7.5	8.5
3.0	7.5	8.5
4.0	7.5	8.5
5.0	7.5	8.5
6.0	7.5	8.5

Figure 4: This chart depicts the tsunami waves as they arrive at the selected reference point (simulated gauge station). It shows the change in wave heights for the two Alaska tsunami scenarios over a 6-hour period. Wave heights vary through time, and the first wave will not necessarily be the largest as waves interfere and reflect off local topography and bathymetry.

Figure 5: These profiles depict the expected maximum tsunami wave elevation for the two Alaska tsunami scenarios along lines A-A' and B-B'. The tsunami scenarios are modeled to occur at static (no flow) tide and equal to the Mean Higher High Water (MHHW) high tide.

Map of Oregon showing 17 numbered locations for the 2017-2018 field season. The map includes major cities like Medford, Eugene, Salem, and Portland, and labels for the Coast Range, Coast Range National Monument, and Coast Range National Forest. A legend at the bottom lists the names of the 17 locations.

G-01-01 Lakeside West	G-00-10 Ithamum Slough
G-02-02 Lakeside East	G-00-11 Catching Slough
G-03-03 Samuels Lake	G-00-12 Bullards Branch
G-04-04 Haynes Island	G-01-13 Lemroe
G-05-05 Goose Bay: North Bend	G-00-14 Gopgalle
G-06-06 Goose Bay: North	G-00-15 Empulse River
G-07-07 Goose Bay: South	G-00-16 Blanton
G-08-08 Charleston: Cape Arago	G-00-17 New River
G-09-09 Harverson: Cape Slough	

Earthquake Size	Slip / Deformation	Mag
	Alaska M9.2 (1964)	Vertical seafloor deformation
	Alaska Maximum	Uniform slip on 12 subfaults with each segment values ranging from 49 to 98 feet.
	Alaska Maximum Wet/Dry Zone	
	Urban Growth Boundary	Fire Station
	Building Footprint	Police Station
	Simulated Gauge Station	School
	Profile Location	Hospital/Urgent
	Senate Bill 379 Line	U.S. Highway
	State Park	State Highway
	Elevation Contour 1500 feet (457 m to 200 ft)	Improved Road

Source Data:
The data used on hydrology and sediment modeling by John Zhang, Oregon Health & Science University, Portland, Oregon, USA, were obtained from the U.S. Geological Survey, Pacific Division, and Oregon Health & Science University, Portland, Oregon, USA.
The hydrologic data, contents of critical facilities, and building structures were courtesy of Oregon State 837199 (Oregon Department of Geology and Mineral Industries, Portland, Oregon, USA).
P. Dickson, DCM 2011 (GIS file, see in press, 2012).
Urban growth boundary 2011 were provided by the Oregon Department of Geology and Mineral Industries (2012).

Software:
The simulations were provided by Casco County were offered by DCM to improve the spatial accuracy of the hydrologic model and to provide a visual record in the original data files.

Label data: the term DCM Label Data (Quadrangles) was used to refer to the data files for the 1:250,000 scale maps, including the following: 43-18000, 43-18000-1, 43-18000-2, 43-18000-3, 43-18000-4, 43-18000-5, 43-18000-6, 43-18000-7, 43-18000-8, 43-18000-9, 43-18000-10, 43-18000-11, 43-18000-12, 43-18000-13, 43-18000-14, 43-18000-15, 43-18000-16, 43-18000-17, 43-18000-18, 43-18000-19, 43-18000-20, 43-18000-21, 43-18000-22, 43-18000-23, 43-18000-24, 43-18000-25, 43-18000-26, 43-18000-27, 43-18000-28, 43-18000-29, 43-18000-30, 43-18000-31, 43-18000-32, 43-18000-33, 43-18000-34, 43-18000-35, 43-18000-36, 43-18000-37, 43-18000-38, 43-18000-39, 43-18000-40, 43-18000-41, 43-18000-42, 43-18000-43, 43-18000-44, 43-18000-45, 43-18000-46, 43-18000-47, 43-18000-48, 43-18000-49, 43-18000-50, 43-18000-51, 43-18000-52, 43-18000-53, 43-18000-54, 43-18000-55, 43-18000-56, 43-18000-57, 43-18000-58, 43-18000-59, 43-18000-60, 43-18000-61, 43-18000-62, 43-18000-63, 43-18000-64, 43-18000-65, 43-18000-66, 43-18000-67, 43-18000-68, 43-18000-69, 43-18000-70, 43-18000-71, 43-18000-72, 43-18000-73, 43-18000-74, 43-18000-75, 43-18000-76, 43-18000-77, 43-18000-78, 43-18000-79, 43-18000-80, 43-18000-81, 43-18000-82, 43-18000-83, 43-18000-84, 43-18000-85, 43-18000-86, 43-18000-87, 43-18000-88, 43-18000-89, 43-18000-90, 43-18000-91, 43-18000-92, 43-18000-93, 43-18000-94, 43-18000-95, 43-18000-96, 43-18000-97, 43-18000-98, 43-18000-99, 43-18000-100, 43-18000-101, 43-18000-102, 43-18000-103, 43-18000-104, 43-18000-105, 43-18000-106, 43-18000-107, 43-18000-108, 43-18000-109, 43-18000-110, 43-18000-111, 43-18000-112, 43-18000-113, 43-18000-114, 43-18000-115, 43-18000-116, 43-18000-117, 43-18000-118, 43-18000-119, 43-18000-120, 43-18000-121, 43-18000-122, 43-18000-123, 43-18000-124, 43-18000-125, 43-18000-126, 43-18000-127, 43-18000-128, 43-18000-129, 43-18000-130, 43-18000-131, 43-18000-132, 43-18000-133, 43-18000-134, 43-18000-135, 43-18000-136, 43-18000-137, 43-18000-138, 43-18000-139, 43-18000-140, 43-18000-141, 43-18000-142, 43-18000-143, 43-18000-144, 43-18000-145, 43-18000-146, 43-18000-147, 43-18000-148, 43-18000-149, 43-18000-150, 43-18000-151, 43-18000-152, 43-18000-153, 43-18000-154, 43-18000-155, 43-18000-156, 43-18000-157, 43-18000-158, 43-18000-159, 43-18000-160, 43-18000-161, 43-18000-162, 43-18000-163, 43-18000-164, 43-18000-165, 43-18000-166, 43-18000-167, 43-18000-168, 43-18000-169, 43-18000-170, 43-18000-171, 43-18000-172, 43-18000-173, 43-18000-174, 43-18000-175, 43-18000-176, 43-18000-177, 43-18000-178, 43-18000-179, 43-18000-180, 43-18000-181, 43-18000-182, 43-18000-183, 43-18000-184, 43-18000-185, 43-18000-186, 43-18000-187, 43-18000-188, 43-18000-189, 43-18000-190, 43-18000-191, 43-18000-192, 43-18000-193, 43-18000-194, 43-18000-195, 43-18000-196, 43-18000-197, 43-18000-198, 43-18000-199, 43-18000-200, 43-18000-201, 43-18000-202, 43-18000-203, 43-18000-204, 43-18000-205, 43-18000-206, 43-18000-207, 43-18000-208, 43-18000-209, 43-18000-210, 43-18000-211, 43-18000-212, 43-18000-213, 43-18000-214, 43-18000-215, 43-18000-216, 43-18000-217, 43-18000-218, 43-18000-219, 43-18000-220, 43-18000-221, 43-18000-222, 43-18000-223, 43-18000-224, 43-18000-225, 43-18000-226, 43-18000-227, 43-18000-228, 43-18000-229, 43-18000-230, 43-18000-231, 43-18000-232, 43-18000-233, 43-18000-234, 43-18000-235, 43-18000-236, 43-18000-237, 43-18000-238, 43-18000-239, 43-18000-240, 43-18000-241, 43-18000-242, 43-18000-243, 43-18000-244, 43-18000-245, 43-18000-246, 43-18000-247, 43-18000-248, 43-18000-249, 43-18000-250, 43-18000-251, 43-18000-252, 43-18000-253, 43-18000-254, 43-18000-255, 43-18000-256, 43-18000-257, 43-18000-258, 43-18000-259, 43-18000-260, 43-18000-261, 43-18000-262, 43-18000-263, 43-18000-264, 43-18000-265, 43-18000-266, 43-18000-267, 43-18000-268, 43-18000-269, 43-18000-270, 43-18000-271, 43-18000-272, 43-18000-273, 43-18000-274, 43-18000-275, 43-18000-276, 43-18000-277, 43-18000-278, 43-18000-279, 43-18000-280, 43-18000-2

