



Stafford Dam Factsheet



**NORTH MARIN
WATER DISTRICT**



Stafford Dam was designed and built by the North Marin Water District (NMWD) and completed in 1951. The dam is listed as the “Novato Creek Dam” under the California Department of Water Resources Division of Safety of Dams (DSOD) inventory as Dam No. 88-0; and in the National Inventory of Dams as National ID No. CA00321.

The primary function of Stafford Dam is impoundment of run-off water for treatment and distribution of potable water to NMWD customers in the Novato Service Area. It collects runoff from approximately 8.3 square miles of Novato Creek’s upper tributary watershed to create Stafford Lake Reservoir. Stafford Lake supplies surface water to the 6 million gallon per day (MGD) Stafford Water Treatment Plant, located just below the dam, that annually provides approximately 750 million gallons (MG) (or ~20%) of Novato’s potable water supply. Fish releases via the primary outlet (a 30-inch pipe) occur between May and October totaling on average 49 MG per year.

Physical characteristics

The dam is an earthen embankment with a reinforced concrete spillway, measuring 71 feet high, measured from upstream toe, and has a crest length of 650 feet. In 1954 the dam’s spillway was raised to increase the storage volume of the reservoir.

In 1985 as part of a joint project with the Marin County Flood Control & Water Conservation District, the dam was enlarged and the crest was raised 8 feet to its current height and a new spillway was constructed downstream of the original one.

The purpose of the alterations was to improve the spillway hydraulics to pass a probable maximum flood (PMF) and to improve the initial release of floodwater into Novato Creek downstream of the dam by reducing and delaying the peak discharge flow rate through the spillway. As a result, a new spillway was constructed which is known as a modified ogee weir with a control crest (or notch). The 1954 upstream spillway is still in place and has the same elevation as the newer spillway. The dam crest elevation 213 feet (NGVD-29), and spillway control crest is at elevation 196 feet and the main crest is at an elevation of 199 feet.

Benefits associated with Stafford Dam

The dam creates Stafford Lake which provides a local water supply for the NMWD’s Novato customers. Approximately 20% of the annual water demand is met by Stafford Lake storage. The 1985 dam enlargement and spillway modifications resulted in a flood control benefit by reducing and delaying the passage of floodwaters downstream in Novato Creek. Stafford Lake shoreline and portions of the watershed provide recreational benefits via the Indian Valley Golf Course and the County of Marin’s Stafford Lake Park.

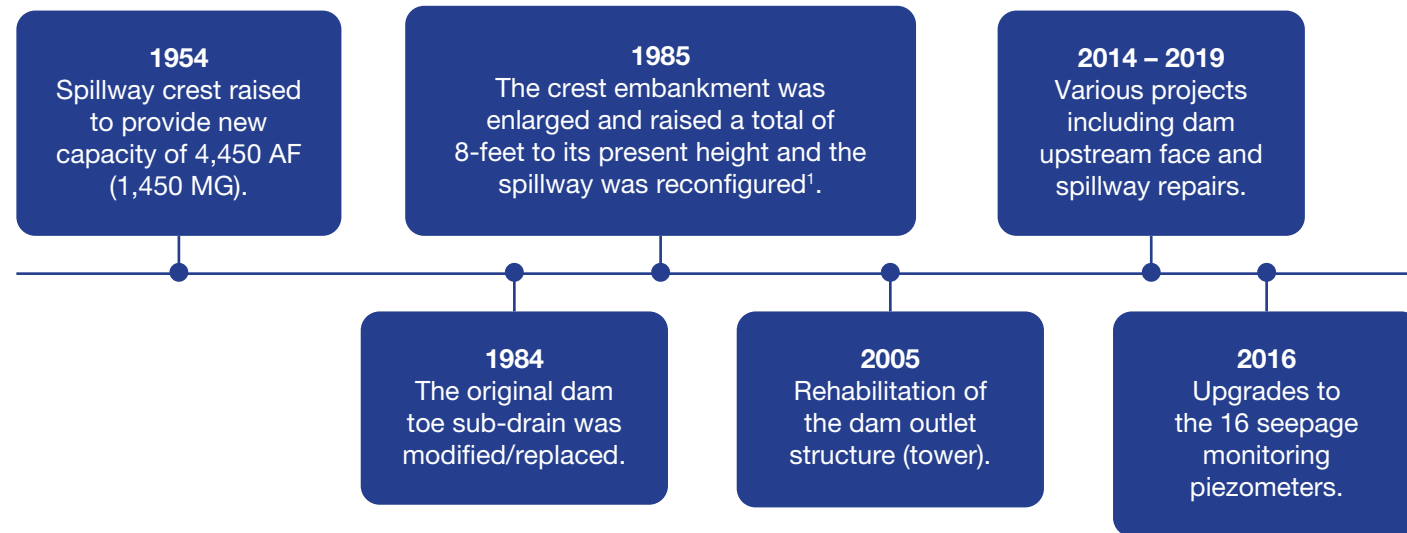
Risks associated with dams in general

Although dam failures are infrequent, the impacts can be major, often far exceeding the typical stream flood events. Some dams reduce the risk of damages and loss of life from inundation due to major floods but do not eliminate this risk. A fully functioning dam could be overtopped when a very rare or infrequent, large flood comes along. A dam could breach because of a design or construction deficiency, or from a massive earthquake, which raises the risk of property damage and life loss even further.

Similarly, a dam’s spillway may not perform properly under extreme conditions or because of latent design or construction deficiencies.

Brief History & Timeline

The original dam's construction was completed in 1951 (three years after formation of the District) with a reservoir capacity of 1,720 AF (560 MG). Subsequently the following major projects have occurred:



Risk associated with Stafford Dam

DSOD has classified Stafford Dam as an Extremely High Hazard Dam²; the federal classification is a High Hazard Dam. This classification is based on the impacts to life and property if the dam were to fail catastrophically when the lake is completely full. NMWD manages this risk through a robust dam safety program that includes:

Daily and weekly visual observations (including use of 24-hour surveillance cameras); **monthly** groundwater water levels via 16 piezometers and 3 seepage drain outlets and associated engineering analysis of groundwater levels/trends; **semi-annual** vegetation and rodent control; **annual** engineering inspections of the dam, dam upstream apron, and spillway, including photo documentation and CIP project development, a water level monitoring and analysis report sent to DSOD and annual inspection by DSOD engineers; **periodic** special engineering inspections based on visual observations engineering analysis by outside specialists for various purposes; and **every 5-years** a survey of dam crest to monitor settlement and movement.

A summary of periodic special investigations and engineering analysis is provided below:

- 1978** Dam Seismic Safety Study conducted (Lee & Praszker).
- 1981** Special inspection by DSOD and Us Army Corps of Engineers (USACE).
- 1986** Dam Seismic Study Update (Lee & Praszker).
- 1992** Dam Seismic Stability Analysis (Woodward-Clyde).
- 2007** Dam Seepage and Stability Analysis (R.C. Harlan).
- 2015** Dam Emergency Action Plan (Michael Baker).
- 2016** Dam Piezometer and Upstream Slope Protection Study (Genterra).
- 2021** Dam and Spillway Emergency Action Plan Update (Michael Baker).

¹ The purpose of the alterations was to improve the spillway hydraulics to pass a probable maximum flood (PMF) and to improve the flood control of Novato Creek downstream of the dam by reducing and delaying the peak discharge flow rate through the spillway.

² Unique classification for California: based on size and the potential for loss of life and property if failure were to occur.

What residents should know

It is important that residents downstream from the dam are aware of the potential consequences in the unlikely event the dam breaches or fails. Inundation mapping was developed in 2021 for a dam failure as well as a spillway failure. The inundation mapping is different and separate from FEMA Flood Insurance Rate Maps which are based on rainfall and subsequent flooding in the various creeks and streams in Marin County.



The Stafford Dam inundation mapping is available from DSOD and can be viewed online by scanning this QR code.



Our partners

NMWD partners with local emergency managers from the City of Novato, the Novato Fire Protection District and the County of Marin Office of Emergency Management and conducts exercises related to dam failures scenarios and responses. Dam Failure is one of many potential emergencies covered in the County's Emergency Operations Plan (EOP) as well as the City of Novato's EOP.

Sign-up for emergency notifications

Alert Marin and Nixle:
emergency.marincounty.org



Flood insurance

Consider purchasing flood insurance if your property is within or near the inundation zone. For more information regarding flood insurance, please visit: floodsmart.gov

More information about dams and living downstream is available from the Association of State Dam Safety Officials by visiting damsafety.org or scanning this QR code.



**Stafford Dam
Dam Failure Analysis
Maximum Depth and Extents**

Exhibit 1

Stafford Dam
Dam Number 88,000
National ID Number CA00321
Marin County, CA
Vertical Elevation Datum: NAVD88
Map Preparation Date: July 10, 2019
Model Simulation Date: July 9, 2019

The information shown is approximate and should be used as a guideline for emergency preparation and response. Security-sensitive infrastructure may not be shown on this map.

The inundation map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

DSOD Inundation Maps dated April 15, 2022 were formally approved on July 31, 2020. This map does not reflect changes or revisions to the previous inundation map.



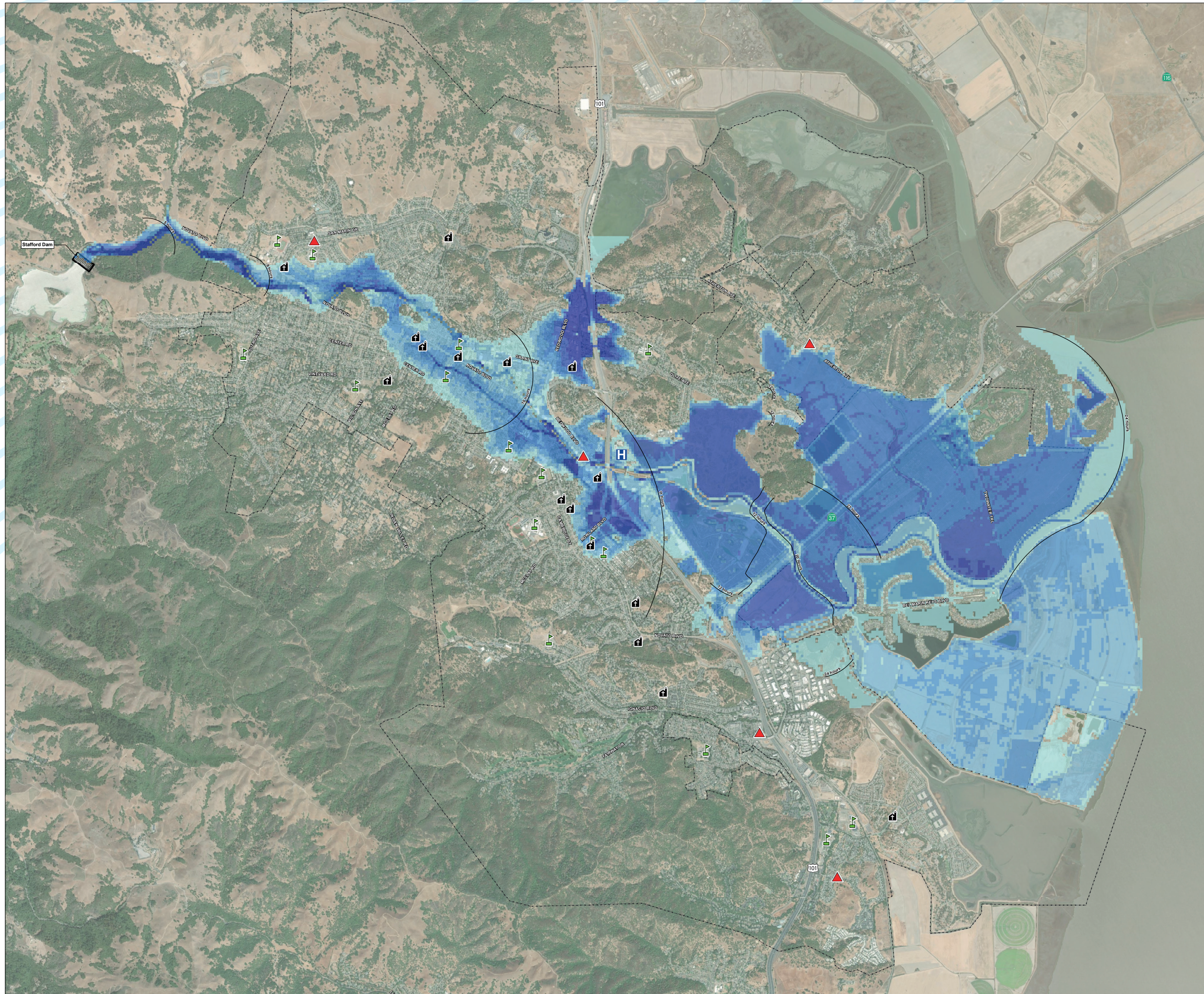
Michael W. Chenoweth

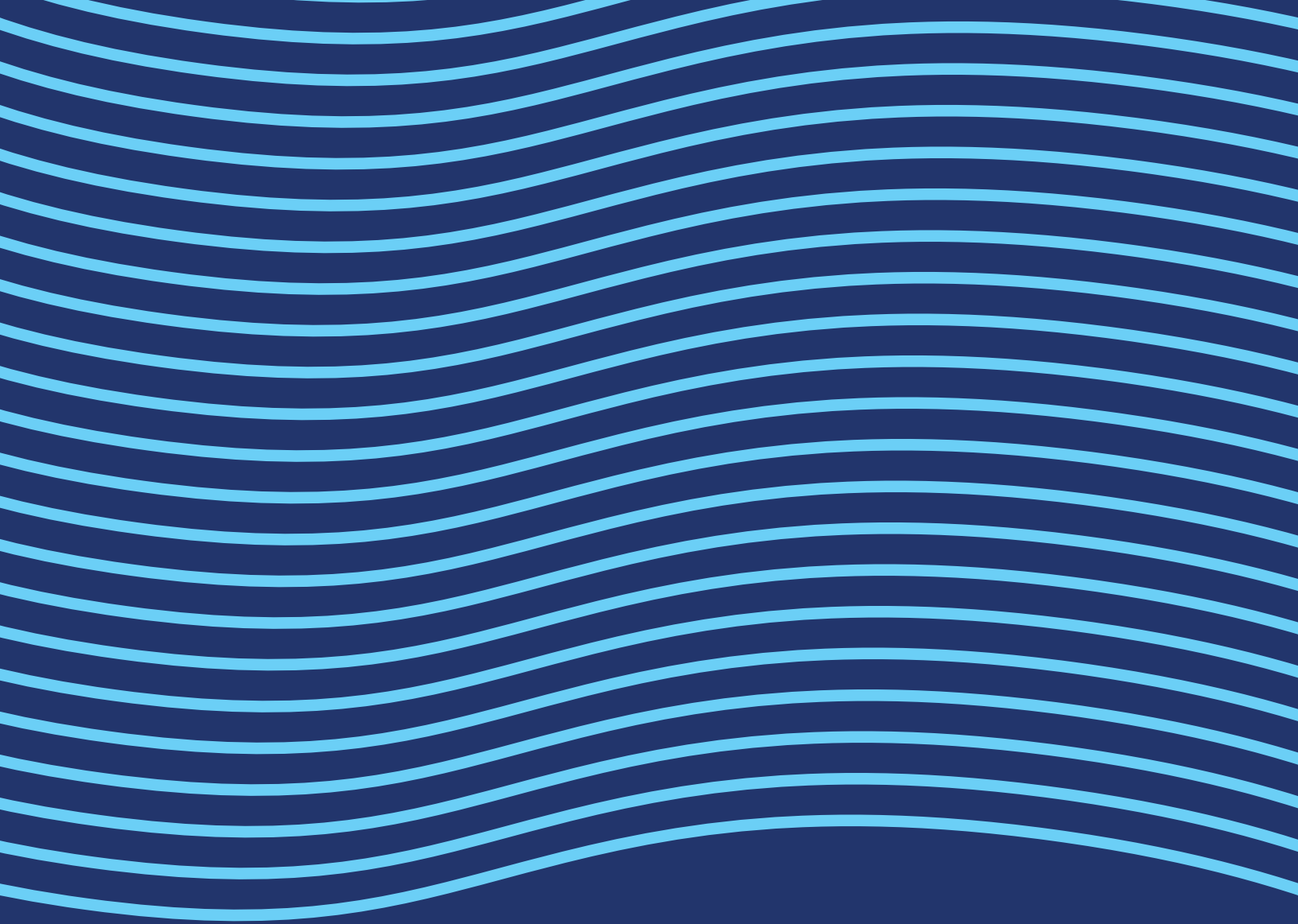
Legend

- Fire Departments
- Hospitals
- Churches
- Schools
- Stafford Dam
- City Boundaries
- Arrival Time

Maximum Depth (ft)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- > 10





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