Note that we have $P = (P_x, P_y)$ and $Q = (Q_x, Q_y) = 2P$. We'd like to find (some? all? of the) elliptic curve parameters, p, a, b. Possibly only p.

Define $\gamma = \dfrac{3P_x^2 + a}{2P_y}$.

Then, from the definition of elliptic curve addition,

$$Q_x \equiv \gamma^2 - 2P_x \qquad \bmod p^k$$

$$\gamma^2 \equiv Q_x + 2P_x \qquad \bmod p^k \qquad (1)$$

$$Q_y \equiv \gamma(P_x - Q_x) - P_y \qquad \bmod p^k$$

$$\gamma \equiv \frac{Q_y + P_y}{P_x - Q_x} \qquad \bmod p^k \qquad (2)$$

Subbing (2) into (1):

$$\left(\frac{Q_y + P_y}{P_x - Q_x}\right)^2 \equiv Q_x + 2P_x \qquad \bmod p^k$$

$$(Q_y + P_y)^2 \equiv (Q_x + 2P_x)(P_x - Q_x)^2 \qquad \bmod p^k$$

$$0 \equiv (Q_y + P_y)^2 - (Q_x + 2P_x)(P_x - Q_x)^2 \qquad \bmod p^k$$

$$np^k = (Q_y + P_y)^2 - (Q_x + 2P_x)(P_x - Q_x)^2$$

Note that we can compute np^k since we have all of the variables on the RHS. We find $p = 12654803915193133223$.

Plugging this into γ, we can find

$$\gamma = \frac{Q_y + P_y}{P_x - Q_x} \qquad (2)$$

$$\gamma = \frac{3P_x^2 + a}{2P_y}$$

$$2P_y\gamma = 3P_x^2 + a$$

$$a = 2P_y\gamma - 3P_x^2$$

Finally, by definition of EC,

$$y^2 = x^3 + ax + b \qquad \bmod p^4$$

$$b = P_y^2 - P_x^3 - aP_x$$